Volume 3 - Price Schedule List

World Bank Funded BWSSB WwTP & Sewer Package (WBS 3)

Item No.	Description
Code 01	Works-A (Lumpsum) - Design, Drawing and Documentation services for WwTP of 5 MLD capacity plant including TSPS at Iblur, WwTP of 10 MLD capacity plant including TSPS at U M Kaval, WwTP of 15 MLD capacity plant including TSPS at Hulimavu, WwTP of 35 MLD capacity plant including TSPS at Anjanapura, ISPS of 3 MLD capacity plant at Vakil Garden and ISPS of 4 MLD capacity plant at Gottigere
Code 02	Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for WwTP of 5 MLD capacity plant including TSPS at Iblur
Code 03	Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 5 MLD capacity plant including TSPS at Iblur
Code 04	Works-A (Lumpsum) - Supply and Installation of Electrical Works for WwTP of 5 MLD capacity plant including TSPS at Iblur
Code 05	Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 5 MLD capacity plant including TSPS at Iblur
Code 06	Works-A (Lumpsum) - Commissioning of Mechanical, Electrical and Instrumentation, Control & Automation Works for entire WwTP plant process including FAT & SAT of 5 MLD capacity plant including TSPS at Iblur
Code 07	Works-A (Lumpsum) - Operation and Maintenance of WwTP of 5 MLD capacity plant including TSPS along with required manpower, chemicals, maintenance, transportation and disposal of sludge cost excluding electricity for 10 years at Iblur
Code 08	Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for WwTP of 10 MLD capacity plant including TSPS at U M Kaval
Code 09	Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 10 MLD capacity plant including TSPS at U M Kaval
Code 10	Works-A (Lumpsum) - Supply and Installation of Electrical Works for WwTP of 10 MLD capacity plant including TSPS at U M Kaval
Code 11	Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 10 MLD capacity plant including TSPS at U M Kaval
Code 12	Works-A (Lumpsum) - Commissioning of Mechanical, Electrical and Instrumentation, Control & Automation Works for entire WwTP plant process including FAT & SAT of 10 MLD capacity plant including TSPS at U M Kaval
Code 13	Works-A (Lumpsum) - Operation and Maintenance of WwTP of 10 MLD capacity plant including TSPS along with required manpower, chemicals, maintenance, transportation and disposal of sludge cost excluding electricityat U M Kaval
Code 14	Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for WwTP of 15 MLD capacity plant including TSPS at Hulimavu
Code 15	Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 15 MLD capacity plant including TSPS at Hulimavu
Code 16	Works-A (Lumpsum) - Supply and Installation of Electrical Works for WwTP of 15 MLD capacity plant including TSPS at Hulimavu
Code 17	Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 15 MLD capacity plant including TSPS at Hulimavu
Code 18	Works-A (Lumpsum) - Commissioning of Mechanical, Electrical and Instrumentation, Control & Automation Works for entire WwTP plant process including FAT & SAT of 15 MLD capacity plant including TSPS at Hulimavu

Code 19	Works-A (Lumpsum) - Operation and Maintenance of WwTP of 15 MLD capacity plant including TSPS along with required manpower, chemicals, maintenance, transportation and disposal of sludge cost excluding electricityat Hulimavu for 10 years
Code 20	Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for WwTP of 35 MLD capacity plant including TSPS at Anjanapura
Code 21	Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 35 MLD capacity plant including TSPS at Anjanapura
Code 22	Works-A (Lumpsum) - Supply and Installation of Electrical Works for WwTP of 35 MLD capacity plant including TSPS at Anjanapura
Code 23	Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 35 MLD capacity plant including TSPS at Anjanapura
Code 24	Works-A (Lumpsum) - Commissioning of Mechanical, Electrical and Instrumentation, Control & Automation Works for entire WwTP plant process including FAT & SAT of 35 MLD capacity plant including TSPS at Anjanapura
Code 25	Works-A (Lumpsum) - Operation and Maintenance of WwTP of 35 MLD capacity plant including TSPS along with required manpower, chemicals, maintenance, transportation and disposal of sludge cost excluding electricity at Anjanapura
Code 26	Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for ISPS of 3 MLD capacity plant at Vakil Garden
Code 27	Works-A (Lumpsum) - Supply and Installation of Mechanical Works for ISPS of 3 MLD capacity plant at Vakil Garden
Code 28	Works-A (Lumpsum) - Supply and Installation of Electrical Works for ISPS of 3 MLD capacity plant at Vakil Garden
Code 29	Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for ISPS of 3 MLD capacity plant at Vakil Garden
Code 30	Works-A (Lumpsum) - Commissioning of Mechanical, Electrical and Instrumentation, Control & Automation Works for entire ISPS plant process including FAT & SAT of 3 MLD capacity plant at Vakil Garden
Code 31	Works-A (Lumpsum) - Operation and Maintenance of ISPS along with required manpower and maintenance cost of 3 MLD capacity plant at Vakil Garden for 10 years
Code 32	Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for ISPS of 4 MLD capacity plant at Gottigere
Code 33	Works-A (Lumpsum) - Supply and Installation of Mechanical Works for ISPS of 4 MLD capacity plant at Gottigere
Code 34	Works-A (Lumpsum) - Supply and Installation of Electrical Works for ISPS of 4 MLD capacity plant at Gottigere
Code 35	Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for ISPS of 4 MLD capacity plant at Gottigere
Code 36	Works-A (Lumpsum) - Commissioning of Mechanical, Electrical and Instrumentation, Control & Automation Works for entire ISPS plant process including FAT & SAT of 4 MLD capacity plant at Gottigere
Code 37	Works-A (Lumpsum) - Operation and Maintenance of ISPS along with required manpower and maintenance cost of 4 MLD capacity plant at Gottigere for 10 years

Code 01	**Works-A (Lumpsum) - Design, Drawing and Documentation services for WwTP of 5 MLD capacity plant including TSPS at Iblur, WwTP of 10 MLD capacity plant including TSPS at U M Kaval, WwTP of 15 MLD capacity plant including TSPS at Hulimavu, WwTP of 35 MLD capacity plant including TSPS at Anjanapura, ISPS of 3 MLD capacity plant at Vakil Garden and ISPS of 4 MLD capacity plant at Gottigere**
Item	**Description**
1.1	**Process Design, Drawings, and Documentation as defined in Volume 2 of Bidding Document**
A	**WwTP of 5 MLD capacity plant including TSPS at Iblur, WwTP of 10 MLD capacity plant including TSPS at U M Kaval, WwTP of 15 MLD capacity plant including TSPS at Hulimavu, WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
	Basic Engineering Package
1.1.1	Flow charts, Process Design, Hydraulic Design, Mass Balance and P & Ids, Dynamic modelling using Biowin Software
1.1.2	Hydraulic Flow diagram
1.1.2	Site Drainage and External Plumbing Etc.
1.1.4	Single Line Diagrams and Electrical Drawings
1.1.5	Instrumentation & Control Systems
1.1.6	Ancillary Works
1.1.7	Hazop Studies and Report Submission
1.1.8	Any other works, as required
1.1.9	Site Layout Plan, Topographical Survey
1.1.10	Bore hole location plan for entire plant and Geotechnical survey
1.1.11	Civil & Mechanical General Arrangement drawings and Architectural drawings complete
1.1.12	Civil & Structural Design Basis Report.
1.1.13	Plant Operation & Control Philosophy
B	**ISPS of 3 MLD capacity plant at Vakil Garden and ISPS of 4 MLD capacity plant at Gottigere**
1.1.14	**Process Design and drawings as defined in Volume 2 of Bidding Document**
1.1.15	Flow charts and process design, Hydraulic Flow diagram, P & IDs, Pumping main LS up to battery limit
1.1.16	Site Layout Plan, Borehole location plan for entire plant, Civil & Mechanical General Arrangement drawings, Geotechnical survey, Pumping main alignment survey and L-section drawings, Topographical Survey, Electrical resistivity test report
1.1.17	Single Line diagrams and Electrical drawings complete
1.1.18	Instrumentation, Control & Automation systems, Functional design specifications,System Architecture drawings complete
1.1.19	Any other necessary document which Bidder feels necessary for project completion needs to be added including all essential Investigation, Model Study (if required), etc. required to complete the Works
1.2	**Civil, Architectural & Structural Designs and Drawings as defined in Volume 2 of Bidding Document**
A	**WwTP of 5 MLD capacity plant including TSPS at Iblur, WwTP of 10 MLD capacity plant including TSPS at U M Kaval, WwTP of 15 MLD capacity plant including TSPS at Hulimavu, WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
	TSPS Works
1.2.1	Inlet manhole & chamber, Coarse Screen channels, Effluent chamber, Overflow chamber, Wetwell with superstructure, Valve & Flowmeter chambers, Thrust block and Anchor blocks etc.
	Inlet Works
1.2.2	Inlet Chamber, Fine Screen Channel, Screen Effluent/ Grit Basin Distribution Channel, chambers, RCC Staircase, etc.
1.2.3	Vortex Grit Basins & chamber, Grit Basin effluent channel, Grit Classifier arrangement,chambers, RCC Staircase, etc.
1.2.4	Parshall Flume, drop chamber, connecting arrangement from Inlet works to Areation basin, RCC Staircase etc
	OR
1.2.5	Suitable foundations and supporting structure for Combi Unit consisting of Stainless steel fabricated unit which includes Fine Screening arrangement with conveyor system and Grit Mechanism along with conveyor,Screening and Grit collection arrangement.
	Treatment Units
1.2.6	Aeration Basin flow distribution channel, Anaerobic Zones, Anoxic Zones, Aerobic Zones, Aeration Basin Effluent Channel, MLR Feed, RAS inlet arrangement, Valve & flowmeter chamber, Overflow & Bypass chamber, RCC Staircase, etc. Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit and Sump pump, Desluding valve chamber, RCC Staircase etc. RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
	OR
1.2.7	MBBR Tank along with media, Strainer, Diffuser system and fixing arrangements for Submersible mixer, Sluice gates and weir gates, Stop logs, flushing arrangement and all allied works complete Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit and Sump pump, Desluding valve chamber, RCC Staircase etc. RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.

Code 01	**Works-A (Lumpsum) - Design, Drawing and Documentation services for WwTP of 5 MLD capacity plant including TSPS at Iblur, WwTP of 10 MLD capacity plant including TSPS at U M Kaval, WwTP of 15 MLD capacity plant including TSPS at Hulimavu, WwTP of 35 MLD capacity plant including TSPS at Anjanapura, ISPS of 3 MLD capacity plant at Vakil Garden and ISPS of 4 MLD capacity plant at Gottigere**
Item	**Description**
	OR
1.2.8	IFAS Tank along media and Frame unit and fixing arrangements for Submersible mixer, Sluice gates and weir gates, Stop logs, flushing arrangement and all allied works complete Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit and Sump pump, Desluding valve chamber, RCC Staircase etc. RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
	OR
1.2.9	SBR Tank, Selector Zone or without Selector zone, SBR Decanting System and fixing arrangements for Sluice gates and weir gates,Scum collection pit and Sump pump, Stop logs, flushing arrangementand all allied works complete
	BLOWER BUILDING
1.2.10	Process Air Blower Building, Valve chamber, Supports for air piping,RCC Stair case etc.
	PRIMARY CLARIFIERS (if applicable)
1.2.11	Flow Distribution Box, Plate Settlers (if applicable)
	SECONDARY CLARIFIERS
1.2.12	Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit, Desluding valve chamber, RCC Staircase etc.
1.2.13	RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
	Chlorine Contact Tank
1.2.14	Chlorine Contact Tank, Inlet chamber, distribution chamber, Effluent Channel/pipe, flowmeter chamber, RCC Staircase, Outfall Structure, etc
1.2.15	Chlorine and Alum building etc and any other chemicals required as per the Process design, etc.
1.2.16	Plant water & Treated water storage sump / Pump Station and inlet flow arrangement, chamber etc.
	Disc Filter
1.2.17	Disc Filter Influent chamber, Disc Filter units and Disc Filter Effluent channel, Backwash water collection arrangement etc.
	SLUDGE DEWATERING
1.2.18	Sludge Dewatering Building including sludge storage, chambers etc.
1.2.19	Dewatering Feed sump and Pumping Station, chambers etc.
1.2.20	Scum Pit,Sump and Pump Station, Chamber etc.
1.2.21	Plant Drain Sump and Pump Station, Chamber etc.
1.2.22	Solar Sludge Dryer (if applicable)
1.2.23	Sludge Thickened Building (if applicable)
1.2.24	Anaerobic Sludge Digestor (if applicable)
1.2.25	Digestor Building (if applicable)
1.2.26	Primary Sludge Pump House (if applicable)
	BIOGAS POWER GENERATION (if applicable)
1.2.27	Bio Gas Storage Tank (if applicable)
1.2.28	Bio Gas Scrubbing Blower Building (if applicable)
1.2.29	Bio Gas Engine Building (if applicable)
	SUBSTATION FOR STP & TSPS
1.2.30	Switch gear room, Electrical Sub station
1.2.31	Transformer yard with Chain link fencing and Gates
	REUSE (if applicable)
1.2.32	UF Building- above GLR (if applicable)
1.2.33	Industrial Reuse Storage Tank-GLR (if applicable)
1.2.34	Industrial Reuse Pumping Station (if applicable)
	UTILITY BUILDINGS
1.2.35	Plant D.G. Room
1.2.36	Administration Cum Laboratory Building & SCADA Building (Two Floors) (For SCADA control room ,refer Particular ICA requirements)
1.2.37	Guard Room (Security Room)
1.2.38	Parking Shed
	OTHER UTILITIES
1.2.39	Internal Roads & stormwater drains and landscaping
1.2.40	Name boards for units in Kannada & English
1.2.41	Approach Road to WwTP, TSPS
1.2.42	Soil Stabilization/Pile foundations/Stone columns/Ground Improvement Plan
1.2.43	GP2, Grouting for machine foundations and base plates

Code 01	**Works-A (Lumpsum) - Design, Drawing and Documentation services for WwTP of 5 MLD capacity plant including TSPS at Iblur, WwTP of 10 MLD capacity plant including TSPS at U M Kaval, WwTP of 15 MLD capacity plant including TSPS at Hulimavu, WwTP of 35 MLD capacity plant including TSPS at Anjanapura, ISPS of 3 MLD capacity plant at Vakil Garden and ISPS of 4 MLD capacity plant at Gottigere**
Item	**Description**
1.2.44	RCC Pre-Cast Compound Wall with gates, Chain link fencing
1.2.45	Site Cleaning, Tree Cutting
1.2.46	Nalla & flow diversion etc.
1.2.47	Gabion wall, Site retaining structure, electric cable trenches inside WwTP site.
1.2.48	Additional Backfill for entire Project including approach road (if required) and Minor Grading
1.2.49	Providing Information Board at Site premises
1.2.50	Tree Plantation
1.2.51	Box culvert/Bridge
1.2.52	Any other works which Bidder feels necessary for project completion needs to be added including all essential Investigation, etc. required to complete the Works under 20.1
1.2.53	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.
B	**ISPS of 3 MLD capacity plant at Vakil Garden and ISPS of 4 MLD capacity plant at Gottigere**
	ISPS Works
1.2.54	Inlet manhole & chamber, Coarse Screen channels, Effluent chamber, Overflow chamber, Wetwell with Pump House, Valve & Flowmeter chambers, Thrust block and Anchor blocks etc.
	SUBSTATION FOR STP & ISPS
1.2.55	Switch gear room, Electrical Sub station
1.2.56	Transformer yard with Chain link fencing and Gates
	UTILITY BUILDINGS
1.2.57	Plant D.G. Room
1.2.58	Guard Room (Security Room)
	OTHER UTILITIES
1.2.59	Internal Roads & stormwater drains and landscaping
1.2.60	Name boards for units in Kannada & English
1.2.61	Approach Road to WwTP, TSPS
1.2.62	Soil Stabilization/Pile foundations/Stone columns/Ground Improvement Plan
1.2.63	GP2, Grouting for machine foundations and base plates
1.2.64	RCC Pre-Cast Compound Wall with gates, Chain link fencing
1.2.65	Site Cleaning, Tree Cutting
1.2.66	Nalla & flow diversion etc.
1.2.67	Gabion wall, Site retaining structure, electric cable trenches inside WwTP site.
1.2.68	Additional Backfill for entire Project including approach road (if required) and Minor Grading
1.2.69	Providing Information Board at Site premises
1.2.70	Tree Plantation
1.2.71	Box culvert/Bridge
1.2.72	Any other works which Bidder feels necessary for project completion needs to be added including all essential Investigation, etc. required to complete the Works under 2.1
1.2.73	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.
1.3	**Mechanical Design calculation and GA Drawings,Quality Assurance Plan and Documentation**
A	**WwTP of 5 MLD capacity plant including TSPS at Iblur, WwTP of 10 MLD capacity plant including TSPS at U M Kaval, WwTP of 15 MLD capacity plant including TSPS at Hulimavu, WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
	TSPS
1.3.1	Inlet & Effluent chambers, Overflow chamber, Screen channels with necessary screening arrangements (Trash & Coarse screen), Solids Grabing unit with monorail arrangement with moving trolley mechanism, Screening Conveyors, Screening collection arrangement, Sluice gates, weir gates and Inlet & Overflow piping with fittings and Hardware with piping and all allied works complete
1.3.2	Wet well with superstructure & Pumping system,Submersible pumps with suitable valves and piping arrangements and Hardware and all allied works complete
1.3.3	Material Handling system with suitable Cranes and hoist arrangements with Hardware and all allied works complete
1.3.4	Miscellaneous works such as flushing arrangements, Grit Removal and dewatering Pumping and ventilation system including Hardware all allied works complete
	WwTP
	Headworks

Code 01	**Works-A (Lumpsum) - Design, Drawing and Documentation services for WwTP of 5 MLD capacity plant including TSPS at Iblur, WwTP of 10 MLD capacity plant including TSPS at U M Kaval, WwTP of 15 MLD capacity plant including TSPS at Hulimavu, WwTP of 35 MLD capacity plant including TSPS at Anjanapura, ISPS of 3 MLD capacity plant at Vakil Garden and ISPS of 4 MLD capacity plant at Gottigere**
Item	**Description**
1.3.5	Inlet chamber and Fine Screen Channel, Overflow chamber, Screen Effluent/ Grit Basin Distribution Channel with Sluice gates, weir gates, Stop logs, Inlet & Overflow piping with fittings, flushing arrangement, including Hardware and all allied works complete
1.3.6	Screen chamber with effluent channel, drain piping and Fine screening, Conveyors, Screening collection arrangement, flushing arrangement, including Hardware and all allied works complete
1.2.7	Vortex Grit mechanism with grit classifier & washing mechanism, Conveyors, Grit collection arrangement, sluice gates, Stop logs, flushing arrangement, including Hardware and all allied works complete
	OR
1.3.8	Combi Unit consisting of Stainless steel fabricated unit which includes Fine Screening arrangement with conveyor system and Grit Mechanism along with conveyor,Screening and Grit collection arrangement, Odour control unit with complete system along with suitable Piping and Hardware items
	Primary Treatment Units
1.3.9	Primary Clarifier system, Inlet & Outlet sluice gates and hardware, Central Drive, Bridge, Scrappers and ancillaries, Tube settler mechanism, Scum withdrawl and pumping arrangement Desludging valves and pipe work, Primary sludge sump and Pumps, valves and Piping and accessories, Hoists & Jib Cranes
	Secondary Treatment Units
1.3.10	MBBR Tank along media, Strainer, Diffuser system, Submersible mixer and Hoisting arrangement With piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete. Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & outlet piping, Distribution Chamber for Secondary Clarifiers with Inlet & Outlet sluice gates, stoplogs, weir arrangement, flushing arrangement, piping and valves including Hardware and all allied works complete. Inlet & Outlet piping, Secondary Clarifiers mechanism, Bridge, scum collection with desludging arrangements,Scum pit and Pumping arrangement,Material Handling Equipment, flushing arrangement, piping and valves including Hardware and all allied works complete.
	OR
1.3.11	IFAS Tank along media and Frame unit,Submersible mixer and Hoisting arrangement With piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete. Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & outlet piping, Distribution Chamber for Secondary Clarifiers with Inlet & Outlet sluice gates, stoplogs, weir arrangement, flushing arrangement, piping and valves including Hardware and all allied works complete. Inlet & Outlet piping, Secondary Clarifiers mechanism, Bridge, scum collection with desludging arrangements,Scum pit and Pumping arrangement,Material Handling Equipment, flushing arrangement, piping and valves including Hardware and all allied works complete.
	OR
1.3.12	Extended Areation Basin/Tank,Submersible mixer and Hoisting arrangement With piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete Inlet & outlet piping, Distribution Chamber for Secondary Clarifiers with Inlet & Outlet sluice gates, stoplogs, weir arrangement, flushing arrangement, piping and valves including Hardware and all allied works complete Inlet & Outlet piping, Secondary Clarifiers mechanism, Bridge, scum collection with desludging arrangements,Scum pit and Pumping arrangement,Material Handling Equipment, flushing arrangement, piping and valves including Hardware and all allied works complete.
	OR
1.3.13	SBR Tank, Selector Zone or without Selector zone, SBR Decanting System,with piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete. Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Scum collection with desludging arrangements,Scum pit and Pumping arrangement

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Item	**Description**
1.3.14	Fine Bubble Diffuser Aeration system arrangement, Pipe grid, Drop legs, piping arrangements, Drain pumpsets, Electric hoist, sluice gates, flushing arrangement, Material Handling Equipment, piping and valves including Hardware and all allied works complete
1.3.15	Process Air Blower Building with blowers, Air Coolers, EOT Crane, Service water & blower cooling arrangement, Piping and valves, Material Handling Equipment, Ventilation system, Hardware and all allied works complete
1.3.16	Alum solution preparation and dosing which includes minimum of preparation and dosing pumpsets to feed maximum average doses efficiently, agitators, mixing arrangement, flushing arrangement, Channel mounted mixer for alum mixing,Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete including bulk storage tank and containment structure in case of a spill.
1.3.17	Inlet & Outlet piping, Disc Filter Influent & Effluent chamber sluice gates, Weir gates, Stoplogs, Disc Filter units with chemical cleaning arrangements.Backwash water system and collection arrangement etc and all allied works complete.
1.3.18	Material pumping station general arrangement,Pumpsets, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping, Valves and all allied works complete
1.3.19	Chlorine & any other chemical dosing arrangement, spill containment bund, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete
1.3.20	Inlet & Outlet piping, Chlorine Contact Tank & Outfall structure with sluice gates, weir gates, Stop logs, mixing arrangement, hardware with piping, valves and all allied works complete, Disk filters.
1.3.21	Reuse works includes Utrafiltration system with Submerged/ Pressurised UF modules and Rack arrangement,Permeate Pumps, Backwash blowers and Pumps, UF Feed Pumps,Caustic dosing system,Citric Acid dosing system and other dosing system as per the process requirement, all type of valves and piping, and Pre filteration, Lifting arrangement, Ventilation system, Electrical and Instrumentation control system for online measuring of all parameters within this Package works along with complete Hardware and supports required for 50% of total WwTP output plant capacity
1.3.22	Sludge Treatment System, Common Sludge Sump & pumping station, Pre-thickening system, Advanced Sludge Treatment System Equipments & accessories, Process Unit Equipments for advanced sludge treatment system, Ancillary Building Equipments for advanced sludge treatment system, Others, bidders to specify.
1.3.23	Anearobic Digester System, Digester Gas mixing Blowers, Digester Sludge mixing Pumps, Digester Sludge Recirculation feed Pumping system, Heat Exchanger System, Digester Gas mixing injection system, Safety Devices for Digester, Digester sludge heating system (Hot water Boiler & Pumps), Hot water Boiler system, Sludge/Biogas Storage tank system, Material Handling Equipment, Ventilation system, Hardware with piping, Valves and all allied works complete
1.3.24	Dewatering feed pumping system, Submersible mixer arrangement, Sludge feed Pumpsets, flushing arrangement, Ventilation system, Material Handling Equipment and Hardware with piping, valves and all allied works complete
1.3.25	Polyelectrolyte dosing systems for sludge dewatering, stirrer arrangement, feeding arrangement, Preparation & Storage tanks, Dosing Pumpsets, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete
1.3.26	Bio-Gas Treatment, Bio-Gas Scrubbing system with Caustic recovery facility complete with Blowers, Dosing system and accessories, Gas Flare complete assembly, Gas Flare complete assembly, Safety Devices
1.3.27	Sludge dewatering units, sludge cake conveying system with cut gate arrangement and hopper & Collection system, Material Handling Equipment for sludge dewatering units, flushing arrangement, Ventilation system, Hardware with piping and all allied works complete
1.3.28	Inlet & Outlet piping, Plant Drain Sump and Pump Station, Submersible pumpsets, Material Handling Equipment, Hardware with piping, Valves and all allied works complete
1.3.29	Inlet & Outlet piping, Treated water storage Pump Station, Submersible pumpsets, Material Handling Equipment, Hardware with piping, Valves and all allied works complete
1.3.30	Inlet & Outlet piping, Plant water Pump Station, Submersible pumpsets, Material Handling Equipment, Sluice gates, Weir gates, Stop log gates,Hardware with piping, Valves, All Plant Piping works and all allied works complete
1.3.31	Flushing arrangement for all chemical & Sludge Material Handling systems, Dewatering Pumps including piping and all allied works in all sludge & Chemical Material Handling pump houses complete
1.3.32	Service water system including pumps with Hardware, piping, Valves and all allied works complete
1.3.33	Fire Fighting system for the whole plant (inclusive of fire alarm,fire detection,fire extinguishing system), Tools Kit, Air conditioning system for SCADA control room & Administration and Laboratory Building and all allied works complete.
1.3.34	Any other works which Bidder feels necessary for project completion needs to be added including all essential Investigation, etc. required to complete the Works under 1.3
1.3.35	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.
B	**ISPS of 3 MLD capacity plant at Vakil Garden and ISPS of 4 MLD capacity plant at Gottigere**

Code 01	**Works-A (Lumpsum) - Design, Drawing and Documentation services for WwTP of 5 MLD capacity plant including TSPS at Iblur, WwTP of 10 MLD capacity plant including TSPS at U M Kaval, WwTP of 15 MLD capacity plant including TSPS at Hulimavu, WwTP of 35 MLD capacity plant including TSPS at Anjanapura, ISPS of 3 MLD capacity plant at Vakil Garden and ISPS of 4 MLD capacity plant at Gottigere**
Item	**Description**
1.3.36	**Mechanical Design calculation and GA Drawings,Quality Assurance Plan and Documentation as defined in Volume 2 of Bidding Document**
1.3.37	Inlet & Effluent chambers, Overflow chamber,Screen channels with necessary screening arrangements (Trash & Coarse screen), Solids Grabing unit with monorail arrangement with moving trolley mechanism, Screening Conveyor, Screening collection arrangement,Sluice gates, weir gates and Inlet & Overflow piping with fittings and Hardware with piping and all allied works complete
1.3.38	Wet well with superstructure & Pumping system with necessary capacity of Submersible pumps with suitable valves and piping arrangements and Hardware and all allied works complete
1.3.39	Material handling system with suitable Cranes and hoist arrangements with Hardware and all allied works complete
1.3.40	Miscellaneous works such as flushing arrangements, dewatering and ventilation system including Hardware all allied works complete
1.3.41	Service water system including pumps with Hardware,piping,Valves and all allied works complete
1.3.42	Fire Fighting system for the whole plant, Tools Kit, Airconditioning system arrangement for PLC / SCADA & and all allied works complete
1.3.43	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.
1.4	**Electrical Design, Drawings and Documents as defined in Volume 2 of Bidding Documents**
	WwTP of 5 MLD capacity plant including TSPS at Iblur, WwTP of 10 MLD capacity plant including TSPS at U M Kaval, WwTP of 15 MLD capacity plant including TSPS at Hulimavu, WwTP of 35 MLD capacity plant including TSPS at Anjanapura & ISPS of 3 MLD capacity plant at Vakil Garden and ISPS of 4 MLD capacity plant at Gottigere
1.4.1	Electrical System Design, Drawings & Documentation as per General Requirements of the Bid document for the followings : i) Single Line Diagram (HT & LT System) ii) Sizing Calculations for 11kV Switchgear Panel, Transformers, DG Set, LT Panels (PCC/MCC), HT/LT Cables, Earthing, Lightning Protection, Bus-bar sizing, Battery Sizing etc. iii) Electrical Equipment Layout / MCC Room / Substation Layout - GA Drawing with Plan and Sections. iv) Cabling Routing Layout for the Plant (Indoor & Outdoor). v) Lighting, Earthing and Lightning layout (Indoor & Outdoor). vi) Guaranteed Technical particulars (GTP), QAP, GA, Control & Wiring diagrams of all electrical equipment. vii) Fault level study, Harmonic study, protection coordination, voltage Dip Calculations viii) Any other necessary document which bidder's feels necessary for project completion needs to be added including all calculations etc. required to complete the Works.
1.5	**Instrumentation, Control, Automation (ICA) Designs, Drawings & Documentation as defined in the Volume 2 of Bidding Documents**
	WwTP of 5 MLD capacity plant including TSPS at Iblur, WwTP of 10 MLD capacity plant including TSPS at U M Kaval, WwTP of 15 MLD capacity plant including TSPS at Hulimavu, WwTP of 35 MLD capacity plant including TSPS at Anjanapura & ISPS of 3 MLD capacity plant at Vakil Garden and ISPS of 4 MLD capacity plant at Gottigere
1.5.1	Instrumentation, Control, Automation (ICA) inclusive of complete field instrumentation,Real time online water quality monitoring systems ,Auto samplers,PLC based SCADA system-Functional design specifications (FDS) for Instrumentation ,FDS for Control & Automation systems,all other equipment required as per specifications,Datasheets & QAP for ICA equipment includes Installation Hook-up Drawings, Cable Layout Drawings etc..FAT Reports,SATreports,Interoperability test reports, and all allied works complete as required under the specifications of Parts-7 &13[Please refer Cl.No.7.6 in Volume-2 of Bid Document for list of detailed ICA design submittals]

Code 02	**Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for WwTP of 5 MLD capacity plant including TSPS at Iblur**
Item	**Description**
2	**Civil and Building Works**
2.1	**TSPS Works**
2.1.1	Inlet manhole & chamber, Coarse Screen channels, Effluent chamber, Overflow chamber, Wetwell with superstructure, Valve & Flowmeter chambers, Thrust block and Anchor blocks etc.
2.2	**Inlet Works**
2.2.1	Inlet Chamber, Fine Screen Channel, Screen Effluent/ Grit Basin Distribution Channel, chambers, RCC Staircase, etc.
2.2.2	Vortex Grit Basins & chamber, Grit Basin effluent channel, Grit Classifier arrangement,chambers, RCC Staircase, etc.
2.2.3	Parshall Flume, drop chamber, connecting arrangement from Inlet works to Areation basin, RCC Staircase etc
	OR
2.2.4	Suitable foundations and supporting structure for Combi Unit consisting of Stainless steel fabricated unit which includes Fine Screening arrangement with conveyor system and Grit Mechanism along with conveyor,Screening and Grit collection arrangement.
2.3	**Treatment Units**
2.3.1	Aeration Basin flow distribution channel, Anaerobic Zones, Anoxic Zones, Aerobic Zones, Aeration Basin Effluent Channel, MLR Feed, RAS inlet arrangement, Valve & flowmeter chamber, Overflow & Bypass chamber, RCC Staircase, etc. Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit and Sump pump, Desluding valve chamber, RCC Staircase etc. RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
	OR
2.3.2	MBBR Tank along with media, Strainer, Diffuser system and fixing arrangements for Submersible mixer, Sluice gates and weir gates, Stop logs, flushing arrangement and all allied works complete Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit and Sump pump, Desluding valve chamber, RCC Staircase etc. RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
	OR
2.3.3	IFAS Tank along media and Frame unit and fixing arrangements for Submersible mixer, Sluice gates and weir gates, Stop logs, flushing arrangement and all allied works complete Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit and Sump pump, Desluding valve chamber, RCC Staircase etc. RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
	OR
2.3.4	SBR Tank, Selector Zone or without Selector zone, SBR Decanting System and fixing arrangements for Sluice gates and weir gates,Scum collection pit and Sump pump, Stop logs, flushing arrangementand all allied works complete
2.4	**BLOWER BUILDING**
2.4.1	Process Air Blower Building, Valve chamber, Supports for air piping,RCC Stair case etc.
2.5	**SECONDARY CLARIFIERS**
2.5.1	Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit, Desluding valve chamber, RCC Staircase etc.
2.5.2	RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
2.6	**Chlorine Contact Tank**

Code 02	**Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for WwTP of 5 MLD capacity plant including TSPS at Iblur**
Item	**Description**
2.6.1	Chlorine Contact Tank, Inlet chamber, distribution chamber, Effluent Channel/pipe, flowmeter chamber, RCC Staircase, Outfall Structure, etc
2.6.2	Chlorine and Alum building etc and any other chemicals required as per the Process design, etc.
2.6.3	Plant water & Treated water storage sump / Pump Station and inlet flow arrangement, chamber etc.
2.7	**Disc Filter**
2.7.1	Disc Filter Influent chamber, Disc Filter units and Disc Filter Effluent channel, Backwash water collection arrangement etc.
2.8	**SLUDGE DEWATERING**
2.8.1	Sludge Dewatering Building including sludge storage, chambers etc.
2.8.2	Dewatering Feed sump and Pumping Station, chambers etc.
2.8.3	Scum Pit,Sump and Pump Station, Chamber etc.
2.8.4	Plant Drain Sump and Pump Station, Chamber etc.
2.9	**SUBSTATION FOR STP & TSPS**
2.9.1	Switch gear room, Electrical Sub station
2.9.2	Transformer yard with Chain link fencing and Gates
2.10	**UTILITY BUILDINGS**
2.10.1	Plant D.G. Room
2.10.2	Administration Cum Laboratory Building & SCADA Building (Two Floors) (For SCADA control room ,refer Particular ICA requirements)
2.10.3	Guard Room (Security Room)
2.10.4	Parking Shed
	OTHER UTILITIES
2.10.5	Internal Roads & stormwater drains and landscaping
2.10.6	Name boards for units in Kannada & English
2.10.7	Approach Road to WwTP, TSPS
2.10.8	Soil Stabilization/Pile foundations/Stone columns/Ground Improvement Plan
2.10.9	GP2, Grouting for machine foundations and base plates
2.10.10	RCC Pre-Cast Compound Wall with gates, Chain link fencing
2.10.11	Site Cleaning, Tree Cutting
2.10.12	Nalla & flow diversion etc.
2.10.13	Gabion wall, Site retaining structure, electric cable trenches inside WwTP site.
2.10.14	Additional Backfill for entire Project including approach road (if required) and Minor Grading
2.10.15	Providing Information Board at Site premises
2.10.16	Tree Plantation
2.10.17	Box culvert/Bridge
2.10.18	Dismantling of existing structures and disposal (if required)
2.11	Any other works which Bidder feels necessary for project completion needs to be added including all essential Investigation, etc. required to complete the Works under 2.1
2.12	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.

Code 03	**Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 5 MLD capacity plant including TSPS at Iblur**
Item	**Description**
3	**Mechanical**
3.1	**TSPS**
3.1.1	Inlet & Effluent chambers, Overflow chamber, Screen channels with necessary screening arrangements (Trash & Coarse screen), Solids Grabing unit with monorail arrangement with moving trolley mechanism, Screening Conveyors, Screening collection arrangement, Sluice gates, weir gates and Inlet & Overflow piping with fittings and Hardware with piping and all allied works complete
3.1.2	Wet well with superstructure & Pumping system , Submersible pumps with suitable valves and piping arrangements and Hardware and all allied works complete
3.1.3	Material Handling system with suitable Cranes and hoist arrangements with Hardware and all allied works complete
3.1.4	Miscellaneous works such as flushing arrangements, Grit Removal and dewatering Pumping and ventilation system including Hardware all allied works complete
3.2	**WwTP**
A	**Headworks**
3.2.1	Inlet chamber and Fine Screen Channel, Overflow chamber, Screen Effluent/ Grit Basin Distribution Channel with Sluice gates, weir gates, Stop logs, Inlet & Overflow piping with fittings, flushing arrangement, including Hardware and all allied works complete
3.2.2	Screen chamber with effluent channel, drain piping and Fine screening, Conveyors, Screening collection arrangement, flushing arrangement, including Hardware and all allied works complete
3.2.3	Vortex Grit mechanism with grit classifier & washing mechanism, Conveyors, Grit collection arrangement, sluice gates, Stop logs, flushing arrangement, including Hardware and all allied works complete
	OR
3.2.4	Combi Unit consisting of Stainless steel fabricated unit which includes Fine Screening arrangement with conveyor system and Grit Mechanism along with conveyor,Screening and Grit collection arrangement, Odour control unit with complete system along with suitable Piping and Hardware items
3.3	**Secondary Treatment Units**
3.3.1	MBBR Tank along media, Strainer, Diffuser system, Submersible mixer and Hoisting arrangement With piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete. Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & outlet piping, Distribution Chamber for Secondary Clarifiers with Inlet & Outlet sluice gates, stoplogs, weir arrangement, flushing arrangement, piping and valves including Hardware and all allied works complete. Inlet & Outlet piping, Secondary Clarifiers mechanism, Bridge, scum collection with desludging arrangements,Scum pit and Pumping arrangement,Material Handling Equipment, flushing arrangement, piping and valves including Hardware and all allied works complete.
	OR

Code 03	**Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 5 MLD capacity plant including TSPS at Iblur**
Item	**Description**
3.3.2	IFAS Tank along media and Frame unit,Submersible mixer and Hoisting arrangement With piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete. Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & outlet piping, Distribution Chamber for Secondary Clarifiers with Inlet & Outlet sluice gates, stoplogs, weir arrangement, flushing arrangement, piping and valves including Hardware and all allied works complete. Inlet & Outlet piping, Secondary Clarifiers mechanism, Bridge, scum collection with desludging arrangements,Scum pit and Pumping arrangement,Material Handling Equipment, flushing arrangement, piping and valves including Hardware and all allied works complete.
	OR
3.3.3	Extended Areation Basin/Tank,Submersible mixer and Hoisting arrangement With piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete Inlet & outlet piping, Distribution Chamber for Secondary Clarifiers with Inlet & Outlet sluice gates, stoplogs, weir arrangement, flushing arrangement, piping and valves including Hardware and all allied works complete Inlet & Outlet piping, Secondary Clarifiers mechanism, Bridge, scum collection with desludging arrangements,Scum pit and Pumping arrangement,Material Handling Equipment, flushing arrangement, piping and valves including Hardware and all allied works complete.
	OR
3.3.4	SBR Tank, Selector Zone or without Selector zone, SBR Decanting System,with piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete. Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Scum collection with desludging arrangements,Scum pit and Pumping arrangement
3.5	Fine Bubble Diffuser Aeration system arrangement, Pipe grid, Drop legs, piping arrangements, Drain pumpsets, Electric hoist, sluice gates, flushing arrangement, Material Handling Equipment, piping and valves including Hardware and all allied works complete
3.6	Process Air Blower Building with blowers, Air Coolers, EOT Crane, Service water & blower cooling arrangement, Piping and valves, Material Handling Equipment, Ventilation system, Hardware and all allied works complete

Code 03	**Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 5 MLD capacity plant including TSPS at Iblur**
Item	**Description**
3.7	Alum solution preparation and dosing which includes minimum of preparation and dosing pumpsets to feed maximum average doses efficiently, agitators, mixing arrangement, flushing arrangement, Channel mounted mixer for alum mixing,Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete including bulk storage tank and containment structure in case of a spill.
3.8	Inlet & Outlet piping, Disc Filter Influent & Effluent chamber sluice gates, Weir gates, Stoplogs, Disc Filter units with chemical cleaning arrangements.Backwash water system and collection arrangement etc and all allied works complete.
3.9	Material pumping station general arrangement,Pumpsets, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping, Valves and all allied works complete
3.10	Chlorine & any other chemical dosing arrangement, spill containment bund, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete
3.11	Inlet & Outlet piping, Chlorine Contact Tank & Outfall structure with sluice gates, weir gates, Stop logs, mixing arrangement, hardware with piping, valves and all allied works complete, Disk filters.
3.12	Dewatering feed pumping system, Submersible mixer arrangement, Sludge feed Pumpsets, flushing arrangement, Ventilation system, Material Handling Equipment and Hardware with piping, valves and all allied works complete
3.13	Polyelectrolyte dosing systems for sludge dewatering, stirrer arrangement, feeding arrangement, Preparation & Storage tanks, Dosing Pumpsets, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete
3.14	Sludge dewatering units, sludge cake conveying system with cut gate arrangement and hopper & Collection system, Material Handling Equipment for sludge dewatering units, flushing arrangement, Ventilation system, Hardware with piping and all allied works complete
3.15	Inlet & Outlet piping, Plant Drain Sump and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete
3.16	Inlet & Outlet piping, Treated water storage Pump Station, Submersible pumpsets, Material Handling Equipment, Hardware with piping, Valves and all allied works complete
3.17	Inlet & Outlet piping, Plant water Pump Station, Submersible pumpsets, Material Handling Equipment, Sluice gates, Weir gates, Stop log gates,Hardware with piping, Valves, All Plant Piping works and all allied works complete
3.18	Flushing arrangement for all chemical & Sludge Material Handling systems, Dewatering Pumps including piping and all allied works in all sludge & Chemical Material Handling pump houses complete
3.19	Service water system including pumps with Hardware, piping, Valves and all allied works complete
3.2	Fire Fighting system for the whole plant (inclusive of fire alarm,fire detection,fire extinguishing system), Tools Kit, Air conditioning system for SCADA control room & Administration and Laboratory Building and all allied works complete.
3.21	Any other works which Bidder feels necessary for project completion needs to be added including all essential Investigation, etc. required to complete the Works under 1.2
3.22	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.

Code 04	**Works-A (Lumpsum) - Supply and Installation of Electrical Works for WwTP of 5 MLD capacity plant including TSPS at Iblur**
Item	**Description**
4	**Electrical Systems [Refer Parts-6 & 12 in volume-2 of the bid document]**
4.1	**11kV underground Cables, Termination Kits at following locations as per scope, specification and drawings.**
4.1.1	11kV Outdoor cable termination at Tariff Metering Unit / BESCOM
4.1.2	11kV Outdoor cable termination at incomer and outgoings of 11kV Point of Supply Breaker (VCB)
4.1.3	11kV Indoor cable terminations at incomer and outgoings of 11kV Metal Enclosed Switchboard of Wastewater Treatment Plant
4.1.4	11kV Outdoor cable terminations at primary side of 11kV / 0.433 kV Transformers of Wastewater Treatment Plant
4.1.5	11kV XLPE Cable from Metering Unit to incomer of 11kV Point of Supply Breaker (VCB)
4.1.6	11kV XLPE Cable from 11kV Point of Supply Breaker (VCB) to incomer of 11kV Metal Enclosed Switchboard of Wastewater Treatment Plant
4.1.7	11kV XLPE Cables from 11kV Metal Enclosed Switchboard to Primary cable end boxes of 11kV/0.433kV Transformers of Wastewater Treatment Plant
4.1.8	11kV Cable Straight through joints
4.2	**Electrical equipments at Wastewater Treatment Plant Substation Building & Process Air Blower Building as per scope, specification and drawings.**
4.2.1	11kV Point of Supply Breaker (VCB) / ICOG Panel
4.2.2	11kV Metal Enclosed Switchboard
4.2.3	Diesel Generator Set complete with AMF Control Panel
4.2.4	11kV / 0.433kV Transformers
4.2.5	LT Non Segregated Aluminium Bus ducts with necessary supporting structure
4.2.6	415V Switchgear PCC
4.2.7	415V APFC Panesl (Capacitor banks with Automatic Power Factor Correction Relay)
4.2.8	110V D.C Battery Bank, Battery Charger with D.C Distribution Board
4.3	**Motor Control Centers , Distribution boards etc of Motor Control Centres, Distribution boards etc at various locations in TSPS & Wastewater Treatment Plant with following major equipment, items as per scope, specification and drawings.**
4.3.1	TSPS MCC
4.3.2	Process Air Blower MCC
4.3.3	Headworks MCC
4.3.4	Centrifuge MCC
4.3.5	RAS MCC
4.3.6	Chlorine MCC
4.3.7	Main Lighting DB
4.3.8	Variable Frequency Drives
4.3.9	Local Push Button Stations
4.3.10	Motorized Valve DBs (MOV DBs)
4.3.11	Exhaust Fans DB / Ventilation Fan DB
4.3.12	Power Distribution Board (PDB) / AC Distribution Board
4.4	**Lighting System at TSPS & Wastewater Treatment Plant with following major equipment, items as per scope, specification and drawings.**
4.4.1	Indoor Lighting Fixtures
4.4.2	Outdoor Lighting Fixtures
4.4.3	Emergency Light Fixtures
4.4.4	Lighting panels
4.4.5	Switchboards, Receptacles, Power Plug & Sockets, Switches, Ceiling fans with regulators etc

Code 04	**Works-A (Lumpsum) - Supply and Installation of Electrical Works for WwTP of 5 MLD capacity plant including TSPS at Iblur**
Item	**Description**
4.4.6	Point wiring with conduits, wires, supports etc for Lighting fixtures, Receptacles, Ceiling fans etc
4.4.7	Street Lighting and Area Lighting poles with Junction boxes and Over hang
4.5	**L.T Cabling System, HT/LT Cable Carrier System of L.T Cabling System, HT/LT Cable Carrier System at TSPS & Wastewater Treatment Plant with following major components as per scope, specification and drawings.**
4.5.1	L.T cables
4.5.2	L.T Cable termination with glands and lugs
4.5.3	Cable trays on supports for both LT and HT Cables
4.5.4	Hume Pipe
4.6	**Earthing & Lightning Protection System of Earthing & Lighting Protection System at TSPS & Wastewater Treatment Plant with following major components as per scope, specification and drawings.**
4.6.1	Earthing Conductor for outdoor main grid
4.6.2	Earthing Conductor for indoor main grid
4.6.3	Earthing Conductors for outdoor equipments and Junction Boxes
4.6.4	Lightning Protection system with Vertical Air Termination network with fixing system, horizontal conductors, roof conductors along with holders, connectors, Down Conductors, test link boxes, lightning earth electrodes etc.
4.6.5	Earthing Conductor for indoor equipments
4.6.6	Earth pits
4.7	**Safety procedures with Signage for Electrical Equipments at TSPS & Wastewater Treatment Plant as per scope, specification and drawings.**
4.8	**The bidder shall list here details of any additional items required for a complete installation**

Code 05	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 5 MLD capacity plant including TSPS at Iblur**
Item	**Description**
5	**Instrumentation Systems**
5.1	**Instrumentation Systems as per Technical Specifications [Refer Parts-7 & 13 in volume-2 of the bid document]**
5.1.1	Open channel flow measurement with Transmitter's along with required accessaries and fittings for open channel flow measurement for the complete Wwtp. The flow meter shall be Interfaced with Plant PLC / SCADA Control system.Refer Parts-7 & 13 in volume-2 of the bid document.
5.1.2	Air Flow Measuring System (Thermal mass flowmeter cum transmitter's common discharge of each air blowers's), Air pressure Measuring System with transmitter (at common discharge of each air blowers's) & Temperature Measuring System with transmitter (at common discharge of each air blowers's) along with the required accessories & fittings for the complete Wwtp.Refer Parts-7 & 13 in volume-2 of the bid document.
5.1.3	Temperature Gauges for Air Temperature Indications pertating to individual discharge of each air blower
5.1.4	Electromagnetic Flowmeter's with Indicating Transmitter's with totalizer (full bore type) with flange Ends, rates shall be inclusive of mating flanges with necessary fasteners and gaskets, for the complete WwTP. The flow meter shall be Interfaced with PLC based scada control system.Refer Parts-5,7 & 13 in volume-2 of the bid document.
5.1.5	Level Transmitter's with indicators & alarms as required including all required Mounting accessories for the complete WwTP and Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
5.1.6	Differential Level Sensor's & Transmitter's with indicators & alarms as required including all required Mounting accessories for the complete WwTP. and Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
5.1.7	Conductivity type Level Switches (back up to level transmitter), High Level & Low Level sensing (with 4 point contact) with necessary instrumentation cabling,glands with suitable stub and flange and bolting arrangement for hook-up, for the complete WwTP and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
5.1.8	Float type Level Gauges with necessary instrumentation cabling,glands with suitable stub and flange and bolting arrangement for hook-up,for the complete WwTP and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
5.1.9	Pressure Transmitter's with necessary instrumentation cabling,manifold,glands and conduit with suitable stub and flange and bolting arrangement for hook-up, for the complete WwTP. and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
5.1.10	Pressure Switches on the pump discharge with necessary instrumentation cabling, glands and conduit with suitable stub and flange and bolting arrangement for hook-up, Pressure switch and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
5.1.11	Glycerine filled stainless steel pressure gauges (for individual pump / blower discharge) of 150 mm Dia. Dail with nipple, snubber for vibration resistance and necessary length of SS tubing suitable for mounting , including isolating valve for maintenance etc.,complete with all lead and lifts etc, for the complete WwTP.Refer Parts-7 & 13 in volume-2 of the bid document.

Code 05	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 5 MLD capacity plant including TSPS at Iblur**
Item	**Description**
5.2	**Online Analytical Instruments as per Technical Specifications[Refer Parts-5,7 & 13 in volume-2 of the bid document]**
5.2.1	Dissolved Oxygen Analyzer + Accessories + fittings
5.2.2	ORP Analyzer's+ Accessories + fittings
5.2.3	pH Analyzer+ Accessories + fittings
5.2.4	Conductivity Analzyer+ Accessories + fittings
5.2.5	Residual Chlorine Analyzer+ Accessories +fittings
5.2.6	MLSS Analyzer-+ Accessories+ Fittings
5.3	**Online Real Time Multi Parameters Continuous Monitoring System for Influent and Treated Sewage Parameters & AutoSamplers[Refer Parts-5,7 & 13 in volume-2 of the bid document]**
5.3.1	All weather refrigerated Auto sampler's
5.3.2	Real time Multi Parameters Continuous Monitoring System for Influent and Treated Sewage Parameters at Inlet & outlet of STP to measure the following parameters (Refer Parameter list in Part-5, Volume-2 of the Bid Document) and communication modules to transmit the data to SCADA system,CPCB and KSPCB data centers as and when required.
5.4	**Lab Instruments with required chemicals & reagents**
5.4.1	Comparator test set for residual chlorine or chloroscope
5.4.2	Multi Parameter (pH & Conductivity Meter)
5.4.3	Mains operated pH meter completed with one calomel electrode and glass electrode
5.4.4	Turbidimeter-Bench Model (Nephelometric Type)
5.4.5	Turbidimeter-Hand held (Portable)
5.4.6	Spectrophotometer
5.4.7	Water bath with 6 to 8 concentric holes and discs, electrically heated
5.4.8	Soxhlet extraction unit
5.4.9	Kjeldahl digestion unit
5.4.10	Hot plates
5.4.11	Distilled water plant
5.4.12	Demineraliser
5.4.13	Refrigerator (320 litres capacity) double door
5.4.14	B.O.D. incubator
5.4.15	Muffle furnace
5.4.16	Electric Oven
5.4.17	Magnetic Stirrer
5.4.18	Monopan balance with digital display
5.4.19	Jar-Test apparatus with RPM controller and simultaneous addition of Chemicals in all jars(Phipps & Bird)
5.4.20	Centrifuge
5.4.21	Gas cylinder if gas supply is not available
5.4.22	Fume cupboard/hood
5.4.23	Field test kit for cations and anions
5.4.24	Depth sampler
5.4.25	Online Total organic carbon analytical analyser
5.4.26	Sieve shaker with standard sieves and Two pan balance, weighing up to 200gm samples
5.4.27	Electronic Weighing Balance (Max. 10 kg)
5.4.28	Durham tubes and Imhoff cones (1 lot)

Code 05	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 5 MLD capacity plant including TSPS at Iblur**
Item	**Description**
5.4.29	D.O meter
5.4.30	Specific Gravity Meter (1.0~1.1 and 1.2~1.3)
5.4.31	Consumables – disposable & reusable type
5.4.32	LIMS Software for Laboratory Equipments
	Equipment Needed For Bacteriological Examination
5.4.33	Hot Air Oven
5.4.34	Autoclave
5.4.35	Incubator 37C or 44C (Water/Air-Jacketed)
5.4.36	Binocular Microscope
5.4.37	Digital pH Meter
5.4.38	Pipette Box (Stainless Steel)
5.4.39	Wooden Racks/Aluminium Racks
5.4.40	Wire Baskets
5.4.41	Cotton/Aluminium Foils
5.4.42	Burners (Bunsen) with Pilot Lamp
5.4.43	Suction Flask (1 Ltr. Cap)
5.4.44	Suction Pump
5.4.45	Sampling Bottles
5.4.46	Measuring Cylinders
5.4.47	Vacuum Pump
5.5	**Bacteriological Media**
5.5.1	M. Endo Broth (dehydrated)
5.5.2	Lactose or Lauryl Tryptose
5.5.3	Mac Conkey broth
5.5.4	Brilliant Green Bile Lactose Broth
5.5.5	Total Plate Count Agar
5.5.6	Peptone/Triyptone Water
5.5.7	Portable Density Meter
5.6	**Instrumentation Cables/cable trays as per Technical Specification [Refer Parts-7 & 13 in volume-2 of the bid document]**
5.6.1	Suppying of Instrumentation & Control Cables and Power Cables, OFC, Glands & Lugs, cable conduits ,etc as required to complete the entire Instrumentation,control and automation system ,required as per specifications
5.6.2	Supplying and installation of cable tray's with cover along with required angle supports, with coupler plates, Anchor bolts and nuts etc complete and the tray should be fitted on the wall / ceiling etc. complete for all instrumentation cables
5.7	**Control & Automation System [Refer Parts-7 & 13 in volume-2 of the bid document]**
5.7.1	Master PLC PanelInternal Wiring Master PLC Panel[Master PLC cum RIO panels painting is RAL 7035 (with interior Brilliant White Glassy Finish) with Ingress Protection of IP-54 conformal coating with sand blasting with Doble Door Glassy Window] inclusive of Latest Hot standby (redundant) Programmable Logical Controller (PLC) CPU,redundant power supply ,redundant communication interface, input/output modules with duplex I/Os for critical I/O's,managed ethernet switches(24 port),to be located in the administration building. Required RIO panels[Min.4 Nos. of RIO-Panels having min. IOs are:DI-1000, DO-500, AI-70 & AO-40] with 15" Color touch screen Panel mounted HMI at various locations in the plant.

Code 05	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 5 MLD capacity plant including TSPS at Iblur**
Item	**Description**
5.7.2	Communication Interface Unit (Redundant Communication GPRS with Dual-SIM support) for interfacing data between the STP & ISPS and further transmission to Centralized SCADA of MIS-2, Shimsha Bhavan via the redundant GPRS communication modules through Interface panel at transmission cum receiving end.
5.7.3	Programming software for PLC
5.7.4	SCADA software(Redundant configuration- Min. 10,000 Tags licensed without any time bound)
5.7.5	Historian software (Min. 1000 Tags licensed without any time bound)
5.7.6	Managed Industrial grade Ethernet switches(24 port switches)
5.7.7	SCADA Server station loaded with SCADA software embeeded with latest Windows Operating system & MS Office (Compatiable for SCADA Software),32" LED monitors connected Via internal LAN network to SCADA servers.Minimum 2 TB capacity hard drive.
5.7.8	NAS Server for Historian[Dual-coreIntel®2.4GHzProcessor,System memory:4GBDDR3RAM,4 x 2 TB SATA6Gb/s,Hard Drive Tray-8xhot-swappable and lockable tray,LAN Port,Form Factor-2U, Rackmount,Storage Controller-RAID-2,Expansion Slot (PCI-E)-2, LAN Port & LED Indicators]
5.7.9	Historian system work station embeeded with latest Windows Operating system & MS Office (Compatiable for HISTORIAN Software),32" LCD monitors connected Via internal LAN network to servers.Minimum 4 TB capacity hard drive.
5.7.10	Engineering Workstation loaded with PLC Programming cum SCADA Graphics softwares [embeeded with latest Windows Operating system & MS Office (Compatiable for PLC cum SCADA Software)],32" LED monitors connected Via internal LAN network to SCADA servers.Minimum 2 TB capacity hard drive.
5.7.11	Latest Laptop (16 inches FHD, Intel I5-13th Generation, 32-GB RAM,1 TB SSD) for online & offline PLC Programming cum diagnostics for communication checks for each RIO panel etc..
5.7.12	LED SCREENS , 55" in array of 2X3 (total 6 monitors) networked with SCADA servers to display the SCADA screens,CCTV Feeds,with all required hardware & software accessories
5.7.13	Control system console for the SCADA server machines,engineering & operator stations,Historian system,CCTV system[For Min., 5-Operator workstations, Printer & Laptop with industrial Grade consoles with chairs]
5.7.14	**Redundant UPS:** 20 KVA on line UPS system as per IEC 62040-I (Safety), IEC 62040-3 (Performance) for critical IT solutions, fully digital IGBT Converter and Inverter, SCR rectifier with Internal /External isolation transformer from DC to AC, PWM, pure sine wave output, double conversion, output pf 0.8, with paralleling facility, standard communication features/options auto and manual static by pass switch three phase input / Three phase output. acoustic level shall be less than 58dB at 1 mtr distance.**Battery:-** Supply and fixing of 12V, 200 AH Tubular battery including wire leads.
5.7.15	Multifunction Color & BW Laser printer-A3 & A4 size and networked with SCADA system
5.7.16	CCTV System
5.7.17	Armoured Instrumentation Cables(Power, Signal & Control) for the plant

Code 05	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 5 MLD capacity plant including TSPS at Iblur**
Item	**Description**
5.7.18	4 nos. of Copper earth pits for each RIO Panel (as per IS - 3043 using 600 X 600 X 3 mm copper earth plate) complete with accessories and hinged cover earthing system and also equiment body earthing of Plant SCADA control room, using 25 X 6 mm copper strip.
5.7.19	GI perforated cable tray with cover along with required angle supports, with coupler plates, Anchor bolts and nuts etc complete and the tray should be fitted on the wall / Ceiling etc. complete. For all instrummnetaiton cables
5.7.20	Field Enclosures having IP-65 for Filed Instruments
5.7.21	Surge Protection Devices (SPDs)
5.7.22	Field Analog Junction boxes
5.7.23	Field Power Junction boxes
5.7.24	Single Mode Redundant Fibre Optic Cable (FOC) for interfacing between Master PLC & each RIO Panel [Which includes HDPE pipes]
5.7.25	**Fire Alarm & Suppression System**
5.7.25.1	Addressable peer to peer Networkable analogue addressable type fire alarm control panel with minimum 1500 Character / 240X64 Pixel / 7inch Touchscreen graphic LCD display. The panel should be equipped with sufficient numbers of loop with 20% spare capacity, with each networkable intelligent fire alarm Control Panel having SLC with capacity of min 250 detectors/ devices in any combination (Min 120 Detector) with key pad, dual flash-based microprocessor technology, inbuilt USB Port for upload and down load the configuration tools, RS232 serial port for direct PC or modem connection, inbuilt NAC's, min 20 programmable Zonal LEDs and operates on 240V AC + 10% with 50 Hz with built in charger. The panel shall have fire, fault relays, option of BMS integration MODBUS/ BACKNET, graphical software for provision of TCP/ IP modules, Remote Access, Class 'X' wiring with provision of both class 'A' and class 'B' wiring in the SLC circuit, user friendly with communication facility to monitor & control the FACPs from a single window. The Panel shall be suitable for minimum of 5000 event record facility, event fetch from FACP facility and the single panel shall be suitable for min 2000 fire zones and 200 Panels/ Nodes in one network with all other accessories required to successfully run the system. The panel shall be completed as per UL and FM/EN54 & VDS standards (The System cost shall be included of all necessary cards, modules, Panel enclosure, CPU and associated accessories to complete the system design)
5.7.25.2	Analogue Addressable loop powered Sounder & Beacon with inbuilt isolator and having Min 15 distinct sound patterns/ multitone to indicate Exit doors and direct occupants for safe and fast evacuation and 100dB output with minimum 1Hz Frequency flash rate designed for IP65 requirements and approved to operate in –10°C to +55°C temperature, complies with the essential requirement of the EMC Directive to be supplied with Junction Box, Glands and other mounting accessories for proper installation.
5.7.25.3	Dust and Vermin proof (Resettable) addressable analogue Manual call boxes along with Isolators inbuilt having front reset mechanism with 170° viewable LED and can be viewed from the distance of 7 M. also have inbuilt isolator having operating temperature from -40°C-70°C to initiate audio visual alarm in case of Human detection of fire. The manual call point must be indoor type with IP 44 rating. The call point must be resettable type without break glass.

Code 05	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 5 MLD capacity plant including TSPS at Iblur**
Item	**Description**
5.7.25.4	Optical smoke detector with LED with standard base having capacity of min 126 address combination. Operating temperature -40°C to 70°C &Humidity 0-95%. The detector should have polling 360-degree viewable LED with 5 class approved response modes all approved with the relevant standards, drift compensation and transient rejection. The detector shall have facility to mount in different comprehensive environment like Hostile environment, precious storage, Warehouse and normal working environments. The detector should have a self-locking mechanism and requires a special tool to remove this detector. The detector should have a hard address inside the base. The detector must have nonvolatile memory to write the installation date & site codes. The detector should be made of fire-retardant material & should be melt above 100-degree C. The detectors must be openable for the cleaning of dust whenever required. All the other specs should be as per the specification attached.
5.7.25.5	Analogue Addressable Multi-sensor (Smoke & Heat) detector with LED with standard base having capacity of min 126 address combination. Operating temperature -40°C to 70°C & Humidity 0-95%. The detector should have polling 360-degree viewable LED with 5 class approved response modes all approved with the relevant standards, drift compensation and transient rejection. The detector should trigger heat alarm as per the A1R class requirement. The detector shall have facility to mount in different comprehensive environment like Hostile environment, Parking Garage, Precious storage, Ware house and normal working environments. The detector should have a self-locking mechanism and requires a special tool to remove this detector. The detector should have a hard address inside the base. The detector should be made of fire-retardant material & should be melt above 100-degree C. The detectors must be open for the cleaning of dust whenever required. The detector must have 4 nonvolatile memories to write the installation date & site codes
5.7.25.6	Analogue addressable Control (Input/Output) module with inbuilt relay and isolator with LED indicator, approved to operate in –10°C to +55°C temperature, complies with the essential requirement of the EMC Directive to be supplied with Junction Box and other mounting accessories for proper installation. In case of Manufacturer with single Input or Output module need to supply One quantity of each for line item.
5.7.26	**Fire Extinguishing System:** ABC stored pressure squeeze grip type fire extinguishers, 9 kg capacity, IS:15683 : 2006, filled with ABC Mono Ammonium Phosphate base powder-90 complete with discharge hose and wall mounting bracket, 2mm Mild Steel, EPDM Rubbers, Pressure Gauge, which work effectively on all class of fires (A, B, C & Electrical fires) with 5 years warranty Including transportation, all taxes and all labour charges etc complete.
5.7.27	2.0 TR Split AC, 3 Star capable of delivering not less than 21600 BTU/hr and above with operating on refrigerant R-410A / R-32, supply for SCADA control Room 2Nos and 1 for each RIO panel.
5.7.28	**Communication Interface Equipment**
5.7.28.1	Interoperability test in co-ordination with Communication Interface Unit (Redundant Communication GPRS with Dual-SIM support) for interfacing data between the STP & ISPS and further transmission to Centralized SCADA of MIS-2, Shimsha Bhavan via the redundant GPRS communication modules through Interface panel at transmission cum receiving end.
5.7.29	**Spares to be provided for the control system on a minimum during commissioning.**
5.7.29.1	Central Processing Unit(CPU)
5.7.29.2	Digital Input Module (32-Channels)

Code 05	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 5 MLD capacity plant including TSPS at Iblur**
Item	**Description**
5.7.29.3	Digital Output Module (32-Channels)
5.7.29.4	Analog Input Module (16-Channels)
5.7.29.5	Analog output module (8-Channels)
5.7.29.6	Managed ethernet switch(24 Port)
5.7.29.7	Communication Module (RIO)
5.7.30	Any other item & accessories not specified above but required to complete the work. Note: 1. Contractor shall list down all equipment with breakup of item, quantity and include the total price of these items. 2. Items not listed and required for completing the job shall be done by contractor without any additional payment.
5.7.31	**The Bidder shall list here details of any additional items required for a complete installation**

Code 08	**Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for WwTP of 10 MLD capacity plant including TSPS at U M Kaval**
Item	**Description**
8	**Civil and Building Works**
8.1	**TSPS Works**
8.1.1	Inlet manhole & chamber, Coarse Screen channels, Effluent chamber, Overflow chamber, Wetwell with superstructure, Valve & Flowmeter chambers, Thrust block and Anchor blocks etc.
8.2	**Inlet Works**
8.2.1	Inlet Chamber, Fine Screen Channel, Screen Effluent/ Grit Basin Distribution Channel, chambers, RCC Staircase, etc.
8.2.2	Vortex Grit Basins & chamber, Grit Basin effluent channel, Grit Classifier arrangement,chambers, RCC Staircase, etc.
8.2.3	Parshall Flume, drop chamber, connecting arrangement from Inlet works to Areation basin, RCC Staircase etc
	OR
8.2.4	Suitable foundations and supporting structure for Combi Unit consisting of Stainless steel fabricated unit which includes Fine Screening arrangement with conveyor system and Grit Mechanism along with conveyor,Screening and Grit collection arrangement.
8.3	**Treatment Units**
8.3.1	Aeration Basin flow distribution channel, Anaerobic Zones, Anoxic Zones, Aerobic Zones, Aeration Basin Effluent Channel, MLR Feed, RAS inlet arrangement, Valve & flowmeter chamber, Overflow & Bypass chamber, RCC Staircase, etc. Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit and Sump pump, Desluding valve chamber, RCC Staircase etc. RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
	OR
8.3.2	MBBR Tank along with media, Strainer, Diffuser system and fixing arrangements for Submersible mixer, Sluice gates and weir gates, Stop logs, flushing arrangement and all allied works complete Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit and Sump pump, Desluding valve chamber, RCC Staircase etc. RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
	OR
8.3.3	IFAS Tank along media and Frame unit and fixing arrangements for Submersible mixer, Sluice gates and weir gates, Stop logs, flushing arrangement and all allied works complete Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit and Sump pump, Desluding valve chamber, RCC Staircase etc. RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
	OR
8.3.4	SBR Tank, Selector Zone or without Selector zone, SBR Decanting System and fixing arrangements for Sluice gates and weir gates,Scum collection pit and Sump pump, Stop logs, flushing arrangementand all allied works complete
8.4	**BLOWER BUILDING**
8.4.1	Process Air Blower Building, Valve chamber, Supports for air piping,RCC Stair case etc.
8.5	**SECONDARY CLARIFIERS**
8.5.1	Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit, Desluding valve chamber, RCC Staircase etc.
8.5.2	RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
8.6	**Chlorine Contact Tank**
8.6.1	Chlorine Contact Tank, Inlet chamber, distribution chamber, Effluent Channel/pipe, flowmeter chamber, RCC Staircase, Outfall Structure, etc
8.6.2	Chlorine and Alum building etc and any other chemicals required as per the Process design, etc.
8.6.3	Plant water & Treated water storage sump / Pump Station and inlet flow arrangement, chamber etc.
8.7	**Disc Filter**
8.7.1	Disc Filter Influent chamber, Disc Filter units and Disc Filter Effluent channel, Backwash water collection arrangement etc.
8.8	**SLUDGE DEWATERING**
8.8.1	Sludge Dewatering Building including sludge storage, chambers etc.

Code 08	**Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for WwTP of 10 MLD capacity plant including TSPS at U M Kaval**
Item	**Description**
8.8.2	Dewatering Feed sump and Pumping Station, chambers etc.
8.8.3	Scum Pit,Sump and Pump Station, Chamber etc.
8.8.4	Plant Drain Sump and Pump Station, Chamber etc.
8.9	**SUBSTATION FOR STP & TSPS**
8.9.1	Switch gear room, Electrical Sub station
8.9.2	Transformer yard with Chain link fencing and Gates
8.10	**REUSE**
8.10.1	UF Building- above GLR
8.10.2	Industrial Reuse Storage Tank-GLR
8.10.3	Industrial Reuse Pumping Station
8.11	**UTILITY BUILDINGS**
8.11.1	Plant D.G. Room
8.11.2	Administration Cum Laboratory Building & SCADA Building (Two Floors) (For SCADA control room ,refer Particular ICA requirements)
8.11.3	Guard Room (Security Room)
8.11.4	Parking Shed
8.11.5	Solar Sludge Dryer
	OTHER UTILITIES
8.11.6	Internal Roads & stormwater drains and landscaping
8.11.7	Name boards for units in Kannada & English
8.11.8	Approach Road to WwTP, TSPS
8.11.9	Soil Stabilization/Pile foundations/Stone columns/Ground Improvement Plan
8.11.10	GP2, Grouting for machine foundations and base plates
8.11.11	RCC Pre-Cast Compound Wall with gates, Chain link fencing
8.11.12	Site Cleaning, Tree Cutting
8.11.13	Nalla & flow diversion etc.
8.11.14	Gabion wall, Site retaining structure, electric cable trenches inside WwTP site.
8.11.15	Additional Backfill for entire Project including approach road (if required) and Minor Grading
8.11.16	Providing Information Board at Site premises
8.11.17	Tree Plantation
8.11.18	Box culvert/Bridge
8.11.19	Dismantling of existing structures and disposal (if required)
8.12	Any other works which Bidder feels necessary for project completion needs to be added including all essential Investigation, etc. required to complete the Works under 8.1
8.13	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.

Code 09	**Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 10 MLD capacity plant including TSPS at U M Kaval**
Item	**Description**
9	**Mechanical**
9.1	**TSPS**
9.1.1	Inlet & Effluent chambers, Overflow chamber, Screen channels with necessary screening arrangements (Trash & Coarse screen), Solids Grabing unit with monorail arrangement with moving trolley mechanism, Screening Conveyors, Screening collection arrangement, Sluice gates, weir gates and Inlet & Overflow piping with fittings and Hardware with piping and all allied works complete
9.1.2	Wet well with superstructure & Pumping system , Submersible pumps with suitable valves and piping arrangements and Hardware and all allied works complete
9.1.3	Material Handling system with suitable Cranes and hoist arrangements with Hardware and all allied works complete
9.1.4	Miscellaneous works such as flushing arrangements, Grit Removal and dewatering Pumping and ventilation system including Hardware all allied works complete
9.2	**WwTP**
A	**Headworks**
9.2.1	Inlet chamber and Fine Screen Channel, Overflow chamber, Screen Effluent/ Grit Basin Distribution Channel with Sluice gates, weir gates, Stop logs, Inlet & Overflow piping with fittings, flushing arrangement, including Hardware and all allied works complete
9.2.2	Screen chamber with effluent channel, drain piping and Fine screening, Conveyors, Screening collection arrangement, flushing arrangement, including Hardware and all allied works complete
9.2.3	Vortex Grit mechanism with grit classifier & washing mechanism, Conveyors, Grit collection arrangement, sluice gates, Stop logs, flushing arrangement, including Hardware and all allied works complete
	OR
9.2.4	Combi Unit consisting of Stainless steel fabricated unit which includes Fine Screening arrangement with conveyor system and Grit Mechanism along with conveyor,Screening and Grit collection arrangement, Odour control unit with complete system along with suitable Piping and Hardware items
9.3	**Secondary Treatment Units**
9.3.1	MBBR Tank along media, Strainer, Diffuser system, Submersible mixer and Hoisting arrangement With piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete. Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & outlet piping, Distribution Chamber for Secondary Clarifiers with Inlet & Outlet sluice gates, stoplogs, weir arrangement, flushing arrangement, piping and valves including Hardware and all allied works complete. Inlet & Outlet piping, Secondary Clarifiers mechanism, Bridge, scum collection with desludging arrangements,Scum pit and Pumping arrangement,Material Handling Equipment, flushing arrangement, piping and valves including Hardware and all allied works complete.
	OR

Code 09	**Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 10 MLD capacity plant including TSPS at U M Kaval**
Item	**Description**
9.3.2	IFAS Tank along media and Frame unit,Submersible mixer and Hoisting arrangement With piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete. Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & outlet piping, Distribution Chamber for Secondary Clarifiers with Inlet & Outlet sluice gates, stoplogs, weir arrangement, flushing arrangement, piping and valves including Hardware and all allied works complete. Inlet & Outlet piping, Secondary Clarifiers mechanism, Bridge, scum collection with desludging arrangements,Scum pit and Pumping arrangement,Material Handling Equipment, flushing arrangement, piping and valves including Hardware and all allied works complete.
	OR
9.3.3	Extended Areation Basin/Tank,Submersible mixer and Hoisting arrangement With piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete Inlet & outlet piping, Distribution Chamber for Secondary Clarifiers with Inlet & Outlet sluice gates, stoplogs, weir arrangement, flushing arrangement, piping and valves including Hardware and all allied works complete Inlet & Outlet piping, Secondary Clarifiers mechanism, Bridge, scum collection with desludging arrangements,Scum pit and Pumping arrangement,Material Handling Equipment, flushing arrangement, piping and valves including Hardware and all allied works complete.
	OR
9.3.4	SBR Tank, Selector Zone or without Selector zone, SBR Decanting System,with piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete. Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Scum collection with desludging arrangements,Scum pit and Pumping arrangement
9.5	Fine Bubble Diffuser Aeration system arrangement, Pipe grid, Drop legs, piping arrangements, Drain pumpsets, Electric hoist, sluice gates, flushing arrangement, Material Handling Equipment, piping and valves including Hardware and all allied works complete
9.6	Process Air Blower Building with blowers, Air Coolers, EOT Crane, Service water & blower cooling arrangement, Piping and valves, Material Handling Equipment, Ventilation system, Hardware and all allied works complete

Code 09	**Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 10 MLD capacity plant including TSPS at U M Kaval**
Item	**Description**
9.7	Alum solution preparation and dosing which includes minimum of preparation and dosing pumpsets to feed maximum average doses efficiently, agitators, mixing arrangement, flushing arrangement, Channel mounted mixer for alum mixing,Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete including bulk storage tank and containment structure in case of a spill.
9.8	Inlet & Outlet piping, Disc Filter Influent & Effluent chamber sluice gates, Weir gates, Stoplogs, Disc Filter units with chemical cleaning arrangements.Backwash water system and collection arrangement etc and all allied works complete.
9.9	Material pumping station general arrangement,Pumpsets, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping, Valves and all allied works complete
9.10	Chlorine & any other chemical dosing arrangement, spill containment bund, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete
9.11	Inlet & Outlet piping, Chlorine Contact Tank & Outfall structure with sluice gates, weir gates, Stop logs, mixing arrangement, hardware with piping, valves and all allied works complete, Disk filters.
9.12	Reuse works includes Utrafiltration system with Submerged/ Pressurised UF modules and Rack arrangement,Permeate Pumps, Backwash blowers and Pumps, UF Feed Pumps,Caustic dosing system,Citric Acid dosing system and other dosing system as per the process requirement, all type of valves and piping, and Pre filteration, Lifting arrangement, Ventilation system, Electrical and Instrumentation control system for online measuring of all parameters within this Package works along with complete Hardware and supports required for 50% of total WwTP output plant capacity
9.13	Dewatering feed pumping system, Submersible mixer arrangement, Sludge feed Pumpsets, flushing arrangement, Ventilation system, Material Handling Equipment and Hardware with piping, valves and all allied works complete
9.14	Polyelectrolyte dosing systems for sludge dewatering, stirrer arrangement, feeding arrangement, Preparation & Storage tanks, Dosing Pumpsets, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete
9.15	Sludge dewatering units, sludge cake conveying system with cut gate arrangement and hopper & Collection system, Material Handling Equipment for sludge dewatering units, flushing arrangement, Ventilation system, Hardware with piping and all allied works complete
9.16	Solar Sludge Drying Bed with Ventilation system, Mechanised drying arrangement with power supply control & MCC Panels, VFD drive etc., Rust Proof Frame structure, Drying Bed covered with Green House Effect along with all accessories
9.17	Inlet & Outlet piping, Plant Drain Sump and Pump Station, Submersible pumpsets, Material Handling Equipment, Hardware with piping, Valves and all allied works complete
9.18	Inlet & Outlet piping, Treated water storage Pump Station, Submersible pumpsets, Material Handling Equipment, Hardware with piping, Valves and all allied works complete
9.19	Inlet & Outlet piping, Plant water Pump Station, Submersible pumpsets, Material Handling Equipment, Sluice gates, Weir gates, Stop log gates,Hardware with piping, Valves, All Plant Piping works and all allied works complete
9.20	Flushing arrangement for all chemical & Sludge Material Handling systems, Dewatering Pumps including piping and all allied works in all sludge & Chemical Material Handling pump houses complete
9.21	Service water system including pumps with Hardware, piping, Valves and all allied works complete

Code 09	**Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 10 MLD capacity plant including TSPS at U M Kaval**
Item	**Description**
9.22	Fire Fighting system for the whole plant (inclusive of fire alarm,fire detection,fire extinguishing system), Tools Kit, Air conditioning system for SCADA control room & Administration and Laboratory Building and all allied works complete.
9.23	Any other works which Bidder feels necessary for project completion needs to be added including all essential Investigation, etc. required to complete the Works under 1.3
9.24	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.

Code 10	**Works-A (Lumpsum) - Supply and Installation of Electrical Works for WwTP of 10 MLD capacity plant including TSPS at U M Kaval**
Item	**Description**
10	**Electrical Systems [Refer Parts-6 & 12 in volume-2 of the bid document]**
10.1	**11kV underground Cables, Termination Kits at following locations as per scope, specification and drawings.**
10.1.1	11kV Outdoor cable termination at Tariff Metering Unit / BESCOM
10.1.2	11kV Outdoor cable termination at incomer and outgoings of 11kV Point of Supply Breaker (VCB)
10.1.3	11kV Indoor cable terminations at incomer and outgoings of 11kV Metal Enclosed Switchboard of Wastewater Treatment Plant
10.1.4	11kV Outdoor cable terminations at primary side of 11kV / 0.433 kV Transformers of Wastewater Treatment Plant
10.1.5	11kV XLPE Cable from Metering Unit to incomer of 11kV Point of Supply Breaker (VCB)
10.1.6	11kV XLPE Cable from 11kV Point of Supply Breaker (VCB) to incomer of 11kV Metal Enclosed Switchboard of Wastewater Treatment Plant
10.1.7	11kV XLPE Cables from 11kV Metal Enclosed Switchboard to Primary cable end boxes of 11kV/0.433kV Transformers of Wastewater Treatment Plant
10.1.8	11kV Cable Straight through joints
10.2	**Electrical equipments at Wastewater Treatment Plant Substation Building & Process Air Blower Building as per scope, specification and drawings.**
10.2.1	11kV Point of Supply Breaker (VCB) / ICOG Panel
10.2.2	11kV Metal Enclosed Switchboard
10.2.3	Diesel Generator Set complete with AMF Control Panel
10.2.4	11kV / 0.433kV Transformers
10.2.5	LT Non Segregated Aluminium Bus ducts with necessary supporting structure
10.2.6	415V Switchgear PCC
10.2.7	415V APFC Panesl (Capacitor banks with Automatic Power Factor Correction Relay)
10.2.8	110V D.C Battery Bank, Battery Charger with D.C Distribution Board
10.3	**Motor Control Centers , Distribution boards etc of Motor Control Centres, Distribution boards etc at various locations in TSPS & Wastewater Treatment Plant with following major equipment, items as per scope, specification and drawings.**
10.3.1	TSPS MCC
10.3.2	Process Air Blower MCC
10.3.3	Headworks MCC
10.3.4	Centrifuge MCC
10.3.5	RAS MCC
10.3.6	Chlorine MCC
10.3.7	Main Lighting DB
10.3.8	Variable Frequency Drives
10.3.9	Local Push Button Stations
10.3.10	Motorized Valve DBs (MOV DBs)
10.3.11	Exhaust Fans DB / Ventilation Fan DB
10.3.12	Power Distribution Board (PDB) / AC Distribution Board
10.4	**Lighting System at TSPS & Wastewater Treatment Plant with following major equipment, items as per scope, specification and drawings.**
10.4.1	Indoor Lighting Fixtures
10.4.2	Outdoor Lighting Fixtures
10.4.3	Emergency Light Fixtures
10.4.4	Lighting panels
10.4.5	Switchboards, Receptacles, Power Plug & Sockets, Switches, Ceiling fans with regulators etc

10.4.6	Point wiring with conduits, wires, supports etc for Lighting fixtures, Receptacles, Ceiling fans etc
10.4.7	Street Lighting and Area Lighting poles with Junction boxes and Over hang
10.5	**L.T Cabling System, HT/LT Cable Carrier System of L.T Cabling System, HT/LT Cable Carrier System at TSPS & Wastewater Treatment Plant with following major components as per scope, specification and drawings.**
10.5.1	L.T cables
10.5.2	L.T Cable termination with glands and lugs
10.5.3	Cable trays on supports for both LT and HT Cables
10.5.4	Hume Pipe
10.6	**Earthing & Lightning Protection System of Earthing & Lighting Protection System at TSPS & Wastewater Treatment Plant with following major components as per scope, specification and drawings.**
10.6.1	Earthing Conductor for outdoor main grid
10.6.2	Earthing Conductor for indoor main grid
10.6.3	Earthing Conductors for outdoor equipments and Junction Boxes
10.6.4	Lightning Protection system with Vertical Air Termination network with fixing system, horizontal conductors, roof conductors along with holders, connectors, Down Conductors, test link boxes, lightning earth electrodes etc.
10.6.5	Earthing Conductor for indoor equipments
10.6.6	Earth pits
10.7	**Safety procedures with Signage for Electrical Equipments at TSPS & Wastewater Treatment Plant as per scope, specification and drawings.**
10.8	**The bidder shall list here details of any additional items required for a complete installation**

Code 11	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 10 MLD capacity plant including TSPS at U M Kaval**
Item	**Description**
11	**Instrumentation Systems**
11.1	**Instrumentation Systems as per Technical Specifications [Refer Parts-7 & 13 in volume-2 of the bid document]**
11.1.1	Open channel flow measurement with Transmitter's along with required accessaries and fittings for open channel flow measurement for the complete Wwtp. The flow meter shall be Interfaced with Plant PLC / SCADA Control system.Refer Parts-7 & 13 in volume-2 of the bid document.
11.1.2	Air Flow Measuring System (Thermal mass flowmeter cum transmitter's common discharge of each air blowers's), Air pressure Measuring System with transmitter (at common discharge of each air blowers's) & Temperature Measuring System with transmitter (at common discharge of each air blowers's) along with the required accessories & fittings for the complete Wwtp.Refer Parts-7 & 13 in volume-2 of the bid document.
11.1.3	Temperature Gauges for Air Temperature Indications pertating to individual discharge of each air blower
11.1.4	Electromagnetic Flowmeter's with Indicating Transmitter's with totalizer (full bore type) with flange Ends, rates shall be inclusive of mating flanges with necessary fasteners and gaskets, for the complete WwTP. The flow meter shall be Interfaced with PLC based scada control system.Refer Parts-5,7 & 13 in volume-2 of the bid document.
11.1.5	Level Transmitter's with indicators & alarms as required including all required Mounting accessories for the complete WwTP and Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
11.1.6	Differential Level Sensor's & Transmitter's with indicators & alarms as required including all required Mounting accessories for the complete WwTP. and Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
11.1.7	Conductivity type Level Switches (back up to level transmitter), High Level & Low Level sensing (with 4 point contact) with necessary instrumentation cabling,glands with suitable stub and flange and bolting arrangement for hook-up, for the complete WwTP and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
11.1.8	Float type Level Gauges with necessary instrumentation cabling,glands with suitable stub and flange and bolting arrangement for hook-up,for the complete WwTP and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
11.1.9	Pressure Transmitter's with necessary instrumentation cabling,manifold,glands and conduit with suitable stub and flange and bolting arrangement for hook-up, for the complete WwTP. and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
11.1.10	Pressure Switches on the pump discharge with necessary instrumentation cabling, glands and conduit with suitable stub and flange and bolting arrangement for hook-up, Pressure switch and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
11.1.11	Glycerine filled stainless steel pressure gauges (for individual pump / blower discharge) of 150 mm Dia. Dail with nipple, snubber for vibration resistance and necessary length of SS tubing suitable for mounting , including isolating valve for maintenance etc.,complete with all lead and lifts etc, for the complete WwTP.Refer Parts-7 & 13 in volume-2 of the bid document.

Code 11	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 10 MLD capacity plant including TSPS at U M Kaval**
Item	**Description**
11.2	**Online Analytical Instruments as per Technical Specifications[Refer Parts-5,7 & 13 in volume-2 of the bid document]**
11.2.1	Dissolved Oxygen Analyzer + Accessories + fittings
11.2.2	ORP Analyzer's+ Accessories + fittings
11.2.3	pH Analyzer+ Accessories + fittings
11.2.4	Conductivity Analzyer+ Accessories + fittings
11.2.5	Residual Chlorine Analyzer+ Accessories +fittings
11.2.6	MLSS Analyzer-+ Accessories+ Fittings
11.3	**Online Real Time Multi Parameters Continuous Monitoring System for Influent and Treated Sewage Parameters & AutoSamplers[Refer Parts-5,7 & 13 in volume-2 of the bid document]**
11.3.1	All weather refrigerated Auto sampler's
11.3.2	Real time Multi Parameters Continuous Monitoring System for Influent and Treated Sewage Parameters at Inlet & outlet of STP to measure the following parameters (Refer Parameter list in Part-5, Volume-2 of the Bid Document) and communication modules to transmit the data to SCADA system,CPCB and KSPCB data centers as and when required.
11.4	**Lab Instruments with required chemicals & reagents**
11.4.1	Comparator test set for residual chlorine or chloroscope
11.4.2	Multi Parameter (pH & Conductivity Meter)
11.4.3	Mains operated pH meter completed with one calomel electrode and glass electrode
11.4.4	Turbidimeter-Bench Model (Nephelometric Type)
11.4.5	Turbidimeter-Hand held (Portable)
11.4.6	Spectrophotometer
11.4.7	Water bath with 6 to 8 concentric holes and discs, electrically heated
11.4.8	Soxhlet extraction unit
11.4.9	Kjeldahl digestion unit
11.4.10	Hot plates
11.4.11	Distilled water plant
11.4.12	Demineraliser
11.4.13	Refrigerator (320 litres capacity) double door
11.4.14	B.O.D. incubator
11.4.15	Muffle furnace
11.4.16	Electric Oven
11.4.17	Magnetic Stirrer
11.4.18	Monopan balance with digital display
11.4.19	Jar-Test apparatus with RPM controller and simultaneous addition of Chemicals in all jars(Phipps & Bird)
11.4.20	Centrifuge
11.4.21	Gas cylinder if gas supply is not available
11.4.22	Fume cupboard/hood
11.4.23	Field test kit for cations and anions
11.4.24	Depth sampler
11.4.25	Online Total organic carbon analytical analyser
11.4.26	Sieve shaker with standard sieves and Two pan balance, weighing up to 200gm samples
11.4.27	Electronic Weighing Balance (Max. 10 kg)
11.4.28	Durham tubes and Imhoff cones (1 lot)

Code 11	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 10 MLD capacity plant including TSPS at U M Kaval**
Item	**Description**
11.4.29	D.O meter
11.4.30	Specific Gravity Meter (1.0~1.1 and 1.2~1.3)
11.4.31	Consumables – disposable & reusable type
11.4.32	LIMS Software for Laboratory Equipments
	Equipment Needed For Bacteriological Examination
11.4.33	Hot Air Oven
11.4.34	Autoclave
11.4.35	Incubator 37C or 44C (Water/Air-Jacketed)
11.4.36	Binocular Microscope
11.4.37	Digital pH Meter
11.4.38	Pipette Box (Stainless Steel)
11.4.39	Wooden Racks/Aluminium Racks
11.4.40	Wire Baskets
11.4.41	Cotton/Aluminium Foils
11.4.42	Burners (Bunsen) with Pilot Lamp
11.4.43	Suction Flask (1 Ltr. Cap)
11.4.44	Suction Pump
11.4.45	Sampling Bottles
11.4.46	Measuring Cylinders
11.4.47	Vacuum Pump
11.5	**Bacteriological Media**
11.5.1	M. Endo Broth (dehydrated)
11.5.2	Lactose or Lauryl Tryptose
11.5.3	Mac Conkey broth
11.5.4	Brilliant Green Bile Lactose Broth
11.5.5	Total Plate Count Agar
11.5.6	Peptone/Triyptone Water
11.5.7	Portable Density Meter
11.6	**Instrumentation Cables/cable trays as per Technical Specification [Refer Parts-7 & 13 in volume-2 of the bid document]**
11.6.1	Suppying of Instrumentation & Control Cables and Power Cables, OFC, Glands & Lugs, cable conduits ,etc as required to complete the entire Instrumentation,control and automation system ,required as per specifications
11.6.2	Supplying and installation of cable tray's with cover along with required angle supports, with coupler plates, Anchor bolts and nuts etc complete and the tray should be fitted on the wall / ceiling etc. complete for all instrumentation cables
11.7	**Control & Automation System [Refer Parts-7 & 13 in volume-2 of the bid document]**
11.7.1	Master PLC PanelInternal Wiring Master PLC Panel[Master PLC cum RIO panels painting is RAL 7035 (with interior Brilliant White Glassy Finish) with Ingress Protection of IP-54 conformal coating with sand blasting with Doble Door Glassy Window] inclusive of Latest Hot standby (redundant) Programmable Logical Controller (PLC) CPU,redundant power supply ,redundant communication interface, input/output modules with duplex I/Os for critical I/O's,managed ethernet switches(24 port),to be located in the administration building. Required RIO panels[Min.4 Nos. of RIO-Panels having min. IOs are:DI-1000, DO-500, AI-70 & AO-40] with 15" Color touch screen Panel mounted HMI at various locations in the plant.

Code 11	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 10 MLD capacity plant including TSPS at U M Kaval**
Item	**Description**
11.7.2	Communication Interface Unit (Redundant Communication GPRS with Dual-SIM support) for interfacing data between the STP & ISPS and further transmission to Centralized SCADA of MIS-2, Shimsha Bhavan via the redundant GPRS communication modules through Interface panel at transmission cum receiving end.
11.7.3	Programming software for PLC
11.7.4	SCADA software(Redundant configuration- Min. 10,000 Tags licensed without any time bound)
11.7.5	Historian software (Min. 1000 Tags licensed without any time bound)
11.7.6	Managed Industrial grade Ethernet switches(24 port switches)
11.7.7	SCADA Server station loaded with SCADA software embeeded with latest Windows Operating system & MS Office (Compatiable for SCADA Software),32" LED monitors connected Via internal LAN network to SCADA servers.Minimum 2 TB capacity hard drive.
11.7.8	NAS Server for Historian[Dual-coreIntel®2.4GHzProcessor,System memory:4GBDDR3RAM,4 x 2 TB SATA6Gb/s,Hard Drive Tray-8xhot-swappable and lockable tray,LAN Port,Form Factor-2U, Rackmount,Storage Controller-RAID-2,Expansion Slot (PCI-E)-2, LAN Port & LED Indicators]
11.7.9	Historian system work station embeeded with latest Windows Operating system & MS Office (Compatiable for HISTORIAN Software),32" LCD monitors connected Via internal LAN network to servers.Minimum 4 TB capacity hard drive.
11.7.10	Engineering Workstation loaded with PLC Programming cum SCADA Graphics softwares [embeeded with latest Windows Operating system & MS Office (Compatiable for PLC cum SCADA Software)],32" LED monitors connected Via internal LAN network to SCADA servers.Minimum 2 TB capacity hard drive.
11.7.11	Latest Laptop (16 inches FHD, Intel I5-13th Generation, 32-GB RAM,1 TB SSD) for online & offline PLC Programming cum diagnostics for communication checks for each RIO panel etc..
11.7.12	LED SCREENS , 55" in array of 2X3 (total 6 monitors) networked with SCADA servers to display the SCADA screens,CCTV Feeds,with all required hardware & software accessories
11.7.13	Control system console for the SCADA server machines,engineering & operator stations,Historian system,CCTV system[For Min., 5-Operator workstations, Printer & Laptop with industrial Grade consoles with chairs]
11.7.14	**Redundant UPS:** 20 KVA on line UPS system as per IEC 62040-I (Safety), IEC 62040-3 (Performance) for critical IT solutions, fully digital IGBT Converter and Inverter, SCR rectifier with Internal /External isolation transformer from DC to AC, PWM, pure sine wave output, double conversion, output pf 0.8, with paralleling facility, standard communication features/options auto and manual static by pass switch three phase input / Three phase output. acoustic level shall be less than 58dB at 1 mtr distance.**Battery:-** Supply and fixing of 12V, 200 AH Tubular battery including wire leads.
11.7.15	Multifunction Color & BW Laser printer-A3 & A4 size and networked with SCADA system
11.7.16	CCTV System
11.7.17	Armoured Instrumentation Cables(Power, Signal & Control) for the plant

Code 11	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 10 MLD capacity plant including TSPS at U M Kaval**
Item	**Description**
11.7.18	4 nos. of Copper earth pits for each RIO Panel (as per IS - 3043 using 600 X 600 X 3 mm copper earth plate) complete with accessories and hinged cover earthing system and also equipment body earthing of Plant SCADA control room, using 25 X 6 mm copper strip.
11.7.19	GI perforated cable tray with cover along with required angle supports, with coupler plates, Anchor bolts and nuts etc complete and the tray should be fitted on the wall / Ceiling etc. complete. For all instrummnetaiton cables
11.7.20	Field Enclosures having IP-65 for Filed Instruments
11.7.21	Surge Protection Devices (SPDs)
11.7.22	Field Analog Junction boxes
11.7.23	Field Power Junction boxes
11.7.24	Single Mode Redundant Fibre Optic Cable (FOC) for interfacing between Master PLC & each RIO Panel [Which includes HDPE pipes]
11.7.25	**Fire Alarm & Suppression System**
11.7.25.1	Addressable peer to peer Networkable analogue addressable type fire alarm control panel with minimum 1500 Character / 240X64 Pixel / 7inch Touchscreen graphic LCD display. The panel should be equipped with sufficient numbers of loop with 20% spare capacity, with each networkable intelligent fire alarm Control Panel having SLC with capacity of min 250 detectors/ devices in any combination (Min 120 Detector) with key pad, dual flash-based microprocessor technology, inbuilt USB Port for upload and down load the configuration tools, RS232 serial port for direct PC or modem connection, inbuilt NAC's, min 20 programmable Zonal LEDs and operates on 240V AC + 10% with 50 Hz with built in charger. The panel shall have fire, fault relays, option of BMS integration MODBUS/ BACKNET, graphical software for provision of TCP/ IP modules, Remote Access, Class 'X' wiring with provision of both class 'A' and class 'B' wiring in the SLC circuit, user friendly with communication facility to monitor & control the FACPs from a single window. The Panel shall be suitable for minimum of 5000 event record facility, event fetch from FACP facility and the single panel shall be suitable for min 2000 fire zones and 200 Panels/ Nodes in one network with all other accessories required to successfully run the system. The panel shall be completed as per UL and FM/EN54 & VDS standards (The System cost shall be included of all necessary cards, modules, Panel enclosure, CPU and associated accessories to complete the system design)
11.7.25.2	Analogue Addressable loop powered Sounder & Beacon with inbuilt isolator and having Min 15 distinct sound patterns/ multitone to indicate Exit doors and direct occupants for safe and fast evacuation and 100dB output with minimum 1Hz Frequency flash rate designed for IP65 requirements and approved to operate in –10°C to +55°C temperature, complies with the essential requirement of the EMC Directive to be supplied with Junction Box, Glands and other mounting accessories for proper installation.
11.7.25.3	Dust and Vermin proof (Resettable) addressable analogue Manual call boxes along with Isolators inbuilt having front reset mechanism with 170° viewable LED and can be viewed from the distance of 7 M. also have inbuilt isolator having operating temperature from -40°C-70°C to initiate audio visual alarm in case of Human detection of fire. The manual call point must be indoor type with IP 44 rating. The call point must be resettable type without break glass.

Code 11	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 10 MLD capacity plant including TSPS at U M Kaval**
Item	**Description**
11.7.25.4	Optical smoke detector with LED with standard base having capacity of min 126 address combination. Operating temperature -40°C to 70°C &Humidity 0-95%. The detector should have polling 360-degree viewable LED with 5 class approved response modes all approved with the relevant standards, drift compensation and transient rejection. The detector shall have facility to mount in different comprehensive environment like Hostile environment, precious storage, Warehouse and normal working environments. The detector should have a self-locking mechanism and requires a special tool to remove this detector. The detector should have a hard address inside the base. The detector must have nonvolatile memory to write the installation date & site codes. The detector should be made of fire-retardant material & should be melt above 100-degree C. The detectors must be openable for the cleaning of dust whenever required. All the other specs should be as per the specification attached.
11.7.25.5	Analogue Addressable Multi-sensor (Smoke & Heat) detector with LED with standard base having capacity of min 126 address combination. Operating temperature -40°C to 70°C & Humidity 0-95%. The detector should have polling 360-degree viewable LED with 5 class approved response modes all approved with the relevant standards, drift compensation and transient rejection. The detector should trigger heat alarm as per the A1R class requirement. The detector shall have facility to mount in different comprehensive environment like Hostile environment, Parking Garage, Precious storage, Ware house and normal working environments. The detector should have a self-locking mechanism and requires a special tool to remove this detector. The detector should have a hard address inside the base. The detector should be made of fire-retardant material & should be melt above 100-degree C. The detectors must be open for the cleaning of dust whenever required. The detector must have 4 nonvolatile memories to write the installation date & site codes
11.7.25.6	Analogue addressable Control (Input/Output) module with inbuilt relay and isolator with LED indicator, approved to operate in –10°C to +55°C temperature, complies with the essential requirement of the EMC Directive to be supplied with Junction Box and other mounting accessories for proper installation. In case of Manufacturer with single Input or Output module need to supply One quantity of each for line item.
11.7.26	**Fire Extinguishing System:** ABC stored pressure squeeze grip type fire extinguishers, 9 kg capacity, IS:15683 : 2006, filled with ABC Mono Ammonium Phosphate base powder-90 complete with discharge hose and wall mounting bracket, 2mm Mild Steel, EPDM Rubbers, Pressure Gauge, which work effectively on all class of fires (A, B, C & Electrical fires) with 5 years warranty Including transportation, all taxes and all labour charges etc complete.
11.7.27	2.0 TR Split AC, 3 Star capable of delivering not less than 21600 BTU/hr and above with operating on refrigerant R-410A / R-32, supply for SCADA control Room 2Nos and 1 for each RIO panel.
11.7.28	**Communication Interface Equipment**
11.7.28.1	Interoperability test in co-ordination with Communication Interface Unit (Redundant Communication GPRS with Dual-SIM support) for interfacing data between the STP & ISPS and further transmission to Centralized SCADA of MIS-2, Shimsha Bhavan via the redundant GPRS communication modules through Interface panel at transmission cum receiving end.
11.7.29	**Spares to be provided for the control system on a minimum during commissioning.**
11.7.29.1	Central Processing Unit(CPU)
11.7.29.2	Digital Input Module (32-Channels)

Code 11	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 10 MLD capacity plant including TSPS at U M Kaval**
Item	**Description**
11.7.29.3	Digital Output Module (32-Channels)
11.7.29.4	Analog Input Module (16-Channels)
11.7.29.5	Analog output module (8-Channels)
11.7.29.6	Managed ethernet switch(24 Port)
11.7.29.7	Communication Module (RIO)
11.7.30	Any other item & accessories not specified above but required to complete the work. Note: 1. Contractor shall list down all equipment with breakup of item, quantity and include the total price of these items. 2. Items not listed and required for completing the job shall be done by contractor without any additional payment.
11.7.31	**The Bidder shall list here details of any additional items required for a complete installation**

Code 14	**Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for WwTP of 15 MLD capacity plant including TSPS at Hulimavu**
Item	**Description**
14	**Civil and Building Works**
14.1	**TSPS Works**
14.1.1	Inlet manhole & chamber, Coarse Screen channels, Effluent chamber, Overflow chamber, Wetwell with superstructure, Valve & Flowmeter chambers, Thrust block and Anchor blocks etc.
14.2	**Inlet Works**
14.2.1	Inlet Chamber, Fine Screen Channel, Screen Effluent/ Grit Basin Distribution Channel, chambers, RCC Staircase, etc.
14.2.2	Vortex Grit Basins & chamber, Grit Basin effluent channel, Grit Classifier arrangement,chambers, RCC Staircase, etc.
14.2.3	Parshall Flume, drop chamber, connecting arrangement from Inlet works to Areation basin, RCC Staircase etc
	OR
14.2.4	Suitable foundations and supporting structure for Combi Unit consisting of Stainless steel fabricated unit which includes Fine Screening arrangement with conveyor system and Grit Mechanism along with conveyor,Screening and Grit collection arrangement.
14.3	**Treatment Units**
14.3.1	Aeration Basin flow distribution channel, Anaerobic Zones, Anoxic Zones, Aerobic Zones, Aeration Basin Effluent Channel, MLR Feed, RAS inlet arrangement, Valve & flowmeter chamber, Overflow & Bypass chamber, RCC Staircase, etc. Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit and Sump pump, Desluding valve chamber, RCC Staircase etc. RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
	OR
14.3.2	MBBR Tank along with media, Strainer, Diffuser system and fixing arrangements for Submersible mixer, Sluice gates and weir gates, Stop logs, flushing arrangement and all allied works complete Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit and Sump pump, Desluding valve chamber, RCC Staircase etc. RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
	OR
14.3.3	IFAS Tank along media and Frame unit and fixing arrangements for Submersible mixer, Sluice gates and weir gates, Stop logs, flushing arrangement and all allied works complete Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit and Sump pump, Desluding valve chamber, RCC Staircase etc. RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
	OR
14.3.4	SBR Tank, Selector Zone or without Selector zone, SBR Decanting System and fixing arrangements for Sluice gates and weir gates,Scum collection pit and Sump pump, Stop logs, flushing arrangementand all allied works complete
14.4	**BLOWER BUILDING**
14.4.1	Process Air Blower Building, Valve chamber, Supports for air piping,RCC Stair case etc.
14.5	**SECONDARY CLARIFIERS**
14.5.1	Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit, Desluding valve chamber, RCC Staircase etc.
14.5.2	RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
14.6	**Chlorine Contact Tank**
14.6.1	Chlorine Contact Tank, Inlet chamber, distribution chamber, Effluent Channel/pipe, flowmeter chamber, RCC Staircase, Outfall Structure, etc
14.6.2	Chlorine and Alum building etc and any other chemicals required as per the Process design, etc.
14.6.3	Plant water & Treated water storage sump / Pump Station and inlet flow arrangement, chamber etc.
14.7	**Disc Filter**
14.7.1	Disc Filter Influent chamber, Disc Filter units and Disc Filter Effluent channel, Backwash water collection arrangement etc.
14.8	**SLUDGE DEWATERING**
14.8.1	Sludge Dewatering Building including sludge storage, chambers etc.

Code 14	**Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for WwTP of 15 MLD capacity plant including TSPS at Hulimavu**
Item	**Description**
14.8.2	Dewatering Feed sump and Pumping Station, chambers etc.
14.8.3	Scum Pit,Sump and Pump Station, Chamber etc.
14.8.4	Plant Drain Sump and Pump Station, Chamber etc.
14.9	**SUBSTATION FOR STP & TSPS**
14.9.1	Switch gear room, Electrical Sub station
14.9.2	Transformer yard with Chain link fencing and Gates
14.10	**UTILITY BUILDINGS**
14.10.1	Plant D.G. Room
14.10.2	Administration Cum Laboratory Building & SCADA Building (Two Floors) (For SCADA control room ,refer Particular ICA requirements)
14.10.3	Guard Room (Security Room)
14.10.4	Parking Shed
	OTHER UTILITIES
14.10.5	Internal Roads & stormwater drains and landscaping
14.10.6	Name boards for units in Kannada & English
14.10.7	Approach Road to WwTP, TSPS
14.10.8	Soil Stabilization/Pile foundations/Stone columns/Ground Improvement Plan
14.10.9	GP2, Grouting for machine foundations and base plates
14.10.10	RCC Pre-Cast Compound Wall with gates, Chain link fencing
14.10.11	Site Cleaning, Tree Cutting
14.10.12	Nalla & flow diversion etc.
14.10.13	Gabion wall, Site retaining structure, electric cable trenches inside WwTP site.
14.10.14	Additional Backfill for entire Project including approach road (if required) and Minor Grading
14.10.15	Providing Information Board at Site premises
14.10.16	Tree Plantation
14.10.17	Box culvert/Bridge
14.10.18	Dismantling of existing structures and disposal (if required)
14.11	Any other works which Bidder feels necessary for project completion needs to be added including all essential Investigation, etc. required to complete the Works under 14.1
14.12	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.

Code 15	**Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 15 MLD capacity plant including TSPS at Hulimavu**
Item	**Description**
3	**Mechanical**
15.1	**TSPS**
15.1.1	Inlet & Effluent chambers, Overflow chamber, Screen channels with necessary screening arrangements (Trash & Coarse screen), Solids Grabing unit with monorail arrangement with moving trolley mechanism, Screening Conveyors, Screening collection arrangement, Sluice gates, weir gates and Inlet & Overflow piping with fittings and Hardware with piping and all allied works complete
15.1.2	Wet well with superstructure & Pumping system , Submersible pumps with suitable valves and piping arrangements and Hardware and all allied works complete
15.1.3	Material Handling system with suitable Cranes and hoist arrangements with Hardware and all allied works complete
15.1.4	Miscellaneous works such as flushing arrangements, Grit Removal and dewatering Pumping and ventilation system including Hardware all allied works complete
15.2	**WwTP**
A	**Headworks**
15.2.1	Inlet chamber and Fine Screen Channel, Overflow chamber, Screen Effluent/ Grit Basin Distribution Channel with Sluice gates, weir gates, Stop logs, Inlet & Overflow piping with fittings, flushing arrangement, including Hardware and all allied works complete
15.2.2	Screen chamber with effluent channel, drain piping and Fine screening, Conveyors, Screening collection arrangement, flushing arrangement, including Hardware and all allied works complete
15.2.3	Vortex Grit mechanism with grit classifier & washing mechanism, Conveyors, Grit collection arrangement, sluice gates, Stop logs, flushing arrangement, including Hardware and all allied works complete
	OR
15.2.4	Combi Unit consisting of Stainless steel fabricated unit which includes Fine Screening arrangement with conveyor system and Grit Mechanism along with conveyor,Screening and Grit collection arrangement, Odour control unit with complete system along with suitable Piping and Hardware items
15.3	**Secondary Treatment Units**
15.3.1	MBBR Tank along media, Strainer, Diffuser system, Submersible mixer and Hoisting arrangement With piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete. Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & outlet piping, Distribution Chamber for Secondary Clarifiers with Inlet & Outlet sluice gates, stoplogs, weir arrangement, flushing arrangement, piping and valves including Hardware and all allied works complete. Inlet & Outlet piping, Secondary Clarifiers mechanism, Bridge, scum collection with desludging arrangements,Scum pit and Pumping arrangement,Material Handling Equipment, flushing arrangement, piping and valves including Hardware and all allied works complete.
	OR

15.3.2	IFAS Tank along media and Frame unit,Submersible mixer and Hoisting arrangement With piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete. Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & outlet piping, Distribution Chamber for Secondary Clarifiers with Inlet & Outlet sluice gates, stoplogs, weir arrangement, flushing arrangement, piping and valves including Hardware and all allied works complete. Inlet & Outlet piping, Secondary Clarifiers mechanism, Bridge, scum collection with desludging arrangements,Scum pit and Pumping arrangement,Material Handling Equipment, flushing arrangement, piping and valves including Hardware and all allied works complete.
	OR
15.3.3	Extended Areation Basin/Tank,Submersible mixer and Hoisting arrangement With piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete Inlet & outlet piping, Distribution Chamber for Secondary Clarifiers with Inlet & Outlet sluice gates, stoplogs, weir arrangement, flushing arrangement, piping and valves including Hardware and all allied works complete Inlet & Outlet piping, Secondary Clarifiers mechanism, Bridge, scum collection with desludging arrangements,Scum pit and Pumping arrangement,Material Handling Equipment, flushing arrangement, piping and valves including Hardware and all allied works complete.
	OR
15.3.4	SBR Tank, Selector Zone or without Selector zone, SBR Decanting System,with piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete. Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Scum collection with desludging arrangements,Scum pit and Pumping arrangement
15.4	Fine Bubble Diffuser Aeration system arrangement, Pipe grid, Drop legs, piping arrangements, Drain pumpsets, Electric hoist, sluice gates, flushing arrangement, Material Handling Equipment, piping and valves including Hardware and all allied works complete
15.5	Process Air Blower Building with blowers, Air Coolers, EOT Crane, Service water & blower cooling arrangement, Piping and valves, Material Handling Equipment, Ventilation system, Hardware and all allied works complete
15.6	Alum solution preparation and dosing which includes minimum of preparation and dosing pumpsets to feed maximum average doses efficiently, agitators, mixing arrangement, flushing arrangement, Channel mounted mixer for alum mixing,Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete including bulk storage tank and containment structure in case of a spill.

15.7	Inlet & Outlet piping, Disc Filter Influent & Effluent chamber sluice gates, Weir gates, Stoplogs, Disc Filter units with chemical cleaning arrangements.Backwash water system and collection arrangement etc and all allied works complete.
15.8	Material pumping station general arrangement,Pumpsets, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping, Valves and all allied works complete
15.9	Chlorine & any other chemical dosing arrangement, spill containment bund, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete
15.10	Inlet & Outlet piping, Chlorine Contact Tank & Outfall structure with sluice gates, weir gates, Stop logs, mixing arrangement, hardware with piping, valves and all allied works complete, Disk filters.
15.11	Dewatering feed pumping system, Submersible mixer arrangement, Sludge feed Pumpsets, flushing arrangement, Ventilation system, Material Handling Equipment and Hardware with piping, valves and all allied works complete
15.12	Polyelectrolyte dosing systems for sludge dewatering, stirrer arrangement, feeding arrangement, Preparation & Storage tanks, Dosing Pumpsets, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete
15.13	Sludge dewatering units, sludge cake conveying system with cut gate arrangement and hopper & Collection system, Material Handling Equipment for sludge dewatering units, flushing arrangement, Ventilation system, Hardware with piping and all allied works complete
15.14	Inlet & Outlet piping, Plant Drain Sump and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete
15.15	Inlet & Outlet piping, Treated water storage Pump Station, Submersible pumpsets, Material Handling Equipment, Hardware with piping, Valves and all allied works complete
15.16	Inlet & Outlet piping, Plant water Pump Station, Submersible pumpsets, Material Handling Equipment, Sluice gates, Weir gates, Stop log gates,Hardware with piping, Valves, All Plant Piping works and all allied works complete
15.17	Flushing arrangement for all chemical & Sludge Material Handling systems, Dewatering Pumps including piping and all allied works in all sludge & Chemical Material Handling pump houses complete
15.18	Service water system including pumps with Hardware, piping, Valves and all allied works complete
15.19	Fire Fighting system for the whole plant (inclusive of fire alarm,fire detection,fire extinguishing system), Tools Kit, Air conditioning system for SCADA control room & Administration and Laboratory Building and all allied works complete.
15.20	Any other works which Bidder feels necessary for project completion needs to be added including all essential Investigation, etc. required to complete the Works under 1.2
15.21	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.

Code 16	**Works-A (Lumpsum) - Supply and Installation of Electrical Works for WwTP of 15 MLD capacity plant including TSPS at Hulimavu**
Item	**Description**
16	**Electrical Systems [Refer Parts-6 & 12 in volume-2 of the bid document]**
16.1	**11kV underground Cables, Termination Kits at following locations as per scope, specification and drawings.**
16.1.1	11kV Outdoor cable termination at Tariff Metering Unit / BESCOM
16.1.2	11kV Outdoor cable termination at incomer and outgoings of 11kV Point of Supply Breaker (VCB)
16.1.3	11kV Indoor cable terminations at incomer and outgoings of 11kV Metal Enclosed Switchboard of Wastewater Treatment Plant
16.1.4	11kV Outdoor cable terminations at primary side of 11kV / 0.433 kV Transformers of Wastewater Treatment Plant
16.1.5	11kV XLPE Cable from Metering Unit to incomer of 11kV Point of Supply Breaker (VCB)
16.1.6	11kV XLPE Cable from 11kV Point of Supply Breaker (VCB) to incomer of 11kV Metal Enclosed Switchboard of Wastewater Treatment Plant
16.1.7	11kV XLPE Cables from 11kV Metal Enclosed Switchboard to Primary cable end boxes of 11kV/0.433kV Transformers of Wastewater Treatment Plant
16.1.8	11kV Cable Straight through joints
16.2	**Electrical equipments at Wastewater Treatment Plant Substation Building & Process Air Blower Building as per scope, specification and drawings.**
16.2.1	11kV Point of Supply Breaker (VCB) / ICOG Panel
16.2.2	11kV Metal Enclosed Switchboard
16.2.3	Diesel Generator Set complete with AMF Control Panel
16.2.4	11kV / 0.433kV Transformers
16.2.5	LT Non Segregated Aluminium Bus ducts with necessary supporting structure
16.2.6	415V Switchgear PCC
16.2.7	415V APFC Panesl (Capacitor banks with Automatic Power Factor Correction Relay)
16.2.8	110V D.C Battery Bank, Battery Charger with D.C Distribution Board
16.3	**Motor Control Centers , Distribution boards etc of Motor Control Centres, Distribution boards etc at various locations in TSPS & Wastewater Treatment Plant with following major equipment, items as per scope, specification and drawings.**
16.3.1	TSPS MCC
16.3.2	Process Air Blower MCC
16.3.3	Headworks MCC
16.3.4	Centrifuge MCC
16.3.5	RAS MCC
16.3.6	Chlorine MCC
16.3.7	Main Lighting DB
16.3.8	Variable Frequency Drives
16.3.9	Local Push Button Stations
16.3.10	Motorized Valve DBs (MOV DBs)
16.3.11	Exhaust Fans DB / Ventilation Fan DB
16.3.12	Power Distribution Board (PDB) / AC Distribution Board
16.4	**Lighting System at TSPS & Wastewater Treatment Plant with following major equipment, items as per scope, specification and drawings.**
16.4.1	Indoor Lighting Fixtures
16.4.2	Outdoor Lighting Fixtures
16.4.3	Emergency Light Fixtures
16.4.4	Lighting panels
16.4.5	Switchboards, Receptacles, Power Plug & Sockets, Switches, Ceiling fans with regulators etc

Code 16	**Works-A (Lumpsum) - Supply and Installation of Electrical Works for WwTP of 15 MLD capacity plant including TSPS at Hulimavu**
Item	**Description**
16.4.6	Point wiring with conduits, wires, supports etc for Lighting fixtures, Receptacles, Ceiling fans etc
16.4.7	Street Lighting and Area Lighting poles with Junction boxes and Over hang
16.5	**L.T Cabling System, HT/LT Cable Carrier System of L.T Cabling System, HT/LT Cable Carrier System at TSPS & Wastewater Treatment Plant with following major components as per scope, specification and drawings.**
16.5.1	L.T cables
16.5.2	L.T Cable termination with glands and lugs
16.5.3	Cable trays on supports for both LT and HT Cables
16.5.4	Hume Pipe
16.6	**Earthing & Lightning Protection System of Earthing & Lighting Protection System at TSPS & Wastewater Treatment Plant with following major components as per scope, specification and drawings.**
16.6.1	Earthing Conductor for outdoor main grid
16.6.2	Earthing Conductor for indoor main grid
16.6.3	Earthing Conductors for outdoor equipments and Junction Boxes
16.6.4	Lightning Protection system with Vertical Air Termination network with fixing system, horizontal conductors, roof conductors along with holders, connectors, Down Conductors, test link boxes, lightning earth electrodes etc.
16.6.5	Earthing Conductor for indoor equipments
16.6.6	Earth pits
16.7	**Safety procedures with Signage for Electrical Equipments at TSPS & Wastewater Treatment Plant as per scope, specification and drawings.**
16.8	**The bidder shall list here details of any additional items required for a complete installation**

Code 17	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 15 MLD capacity plant including TSPS at Hulimavu**
Item	**Description**
17	**Instrumentation Systems**
17.1	**Instrumentation Systems as per Technical Specifications [Refer Parts-7 & 13 in volume-2 of the bid document]**
17.1.1	Open channel flow measurement with Transmitter's along with required accessaries and fittings for open channel flow measurement for the complete Wwtp. The flow meter shall be Interfaced with Plant PLC / SCADA Control system.Refer Parts-7 & 13 in volume-2 of the bid document.
17.1.2	Air Flow Measuring System (Thermal mass flowmeter cum transmitter's common discharge of each air blowers's), Air pressure Measuring System with transmitter (at common discharge of each air blowers's) & Temperature Measuring System with transmitter (at common discharge of each air blowers's) along with the required accessories & fittings for the complete Wwtp.Refer Parts-7 & 13 in volume-2 of the bid document.
17.1.3	Temperature Gauges for Air Temperature Indications pertating to individual discharge of each air blower
17.1.4	Electromagnetic Flowmeter's with Indicating Transmitter's with totalizer (full bore type) with flange Ends, rates shall be inclusive of mating flanges with necessary fasteners and gaskets, for the complete WwTP. The flow meter shall be Interfaced with PLC based scada control system.Refer Parts-5,7 & 13 in volume-2 of the bid document.
17.1.5	Level Transmitter's with indicators & alarms as required including all required Mounting accessories for the complete WwTP and Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
17.1.6	Differential Level Sensor's & Transmitter's with indicators & alarms as required including all required Mounting accessories for the complete WwTP. and Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
17.1.7	Conductivity type Level Switches (back up to level transmitter), High Level & Low Level sensing (with 4 point contact) with necessary instrumentation cabling,glands with suitable stub and flange and bolting arrangement for hook-up, for the complete WwTP and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
17.1.8	Float type Level Gauges with necessary instrumentation cabling,glands with suitable stub and flange and bolting arrangement for hook-up,for the complete WwTP and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
17.1.9	Pressure Transmitter's with necessary instrumentation cabling,manifold,glands and conduit with suitable stub and flange and bolting arrangement for hook-up, for the complete WwTP. and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
17.1.10	Pressure Switches on the pump discharge with necessary instrumentation cabling, glands and conduit with suitable stub and flange and bolting arrangement for hook-up, Pressure switch and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
17.1.11	Glycerine filled stainless steel pressure gauges (for individual pump / blower discharge) of 150 mm Dia. Dail with nipple, snubber for vibration resistance and necessary length of SS tubing suitable for mounting , including isolating valve for maintenance etc.,complete with all lead and lifts etc, for the complete WwTP.Refer Parts-7 & 13 in volume-2 of the bid document.

Code 17	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 15 MLD capacity plant including TSPS at Hulimavu**
Item	**Description**
17.2	**Online Analytical Instruments as per Technical Specifications[Refer Parts-5,7 & 13 in volume-2 of the bid document]**
17.2.1	Dissolved Oxygen Analyzer + Accessories + fittings
17.2.2	ORP Analyzer's+ Accessories + fittings
17.2.3	pH Analyzer+ Accessories + fittings
17.2.4	Conductivity Analzyer+ Accessories + fittings
17.2.5	Residual Chlorine Analyzer+ Accessories +fittings
17.2.6	MLSS Analyzer-+ Accessories+ Fittings
17.3	**Online Real Time Multi Parameters Continuous Monitoring System for Influent and Treated Sewage Parameters & AutoSamplers[Refer Parts-5,7 & 13 in volume-2 of the bid document]**
17.3.1	All weather refrigerated Auto sampler's
17.3.2	Real time Multi Parameters Continuous Monitoring System for Influent and Treated Sewage Parameters at Inlet & outlet of STP to measure the following parameters (Refer Parameter list in Part-5, Volume-2 of the Bid Document) and communication modules to transmit the data to SCADA system,CPCB and KSPCB data centers as and when required.
17.4	**Lab Instruments with required chemicals & reagents**
17.4.1	Comparator test set for residual chlorine or chloroscope
17.4.2	Multi Parameter (pH & Conductivity Meter)
17.4.3	Mains operated pH meter completed with one calomel electrode and glass electrode
17.4.4	Turbidimeter-Bench Model (Nephelometric Type)
17.4.5	Turbidimeter-Hand held (Portable)
17.4.6	Spectrophotometer
17.4.7	Water bath with 6 to 8 concentric holes and discs, electrically heated
17.4.8	Soxhlet extraction unit
17.4.9	Kjeldahl digestion unit
17.4.10	Hot plates
17.4.11	Distilled water plant
17.4.12	Demineraliser
17.4.13	Refrigerator (320 litres capacity) double door
17.4.14	B.O.D. incubator
17.4.15	Muffle furnace
17.4.16	Electric Oven
17.4.17	Magnetic Stirrer
17.4.18	Monopan balance with digital display
17.4.19	Jar-Test apparatus with RPM controller and simultaneous addition of Chemicals in all jars(Phipps & Bird)
17.4.20	Centrifuge
17.4.21	Gas cylinder if gas supply is not available
17.4.22	Fume cupboard/hood
17.4.23	Field test kit for cations and anions
17.4.24	Depth sampler
17.4.25	Online Total organic carbon analytical analyser
17.4.26	Sieve shaker with standard sieves and Two pan balance, weighing up to 200gm samples
17.4.27	Electronic Weighing Balance (Max. 10 kg)
17.4.28	Durham tubes and Imhoff cones (1 lot)

Code 17	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 15 MLD capacity plant including TSPS at Hulimavu**
Item	**Description**
17.4.29	D.O meter
17.4.30	Specific Gravity Meter (1.0~1.1 and 1.2~1.3)
17.4.31	Consumables – disposable & reusable type
17.4.32	LIMS Software for Laboratory Equipments
	Equipment Needed For Bacteriological Examination
17.4.33	Hot Air Oven
17.4.34	Autoclave
17.4.35	Incubator 37C or 44C (Water/Air-Jacketed)
17.4.36	Binocular Microscope
17.4.37	Digital pH Meter
17.4.38	Pipette Box (Stainless Steel)
17.4.39	Wooden Racks/Aluminium Racks
17.4.40	Wire Baskets
17.4.41	Cotton/Aluminium Foils
17.4.42	Burners (Bunsen) with Pilot Lamp
17.4.43	Suction Flask (1 Ltr. Cap)
17.4.44	Suction Pump
17.4.45	Sampling Bottles
17.4.46	Measuring Cylinders
17.4.47	Vacuum Pump
17.5	**Bacteriological Media**
17.5.1	M. Endo Broth (dehydrated)
17.5.2	Lactose or Lauryl Tryptose
17.5.3	Mac Conkey broth
17.5.4	Brilliant Green Bile Lactose Broth
17.5.5	Total Plate Count Agar
17.5.6	Peptone/Triyptone Water
17.5.7	Portable Density Meter
17.6	**Instrumentation Cables/cable trays as per Technical Specification [Refer Parts-7 & 13 in volume-2 of the bid document]**
17.6.1	Suppying of Instrumentation & Control Cables and Power Cables, OFC, Glands & Lugs, cable conduits ,etc as required to complete the entire Instrumentation,control and automation system ,required as per specifications
17.6.2	Supplying and installation of cable tray's with cover along with required angle supports, with coupler plates, Anchor bolts and nuts etc complete and the tray should be fitted on the wall / ceiling etc. complete for all instrumentation cables
17.7	**Control & Automation System [Refer Parts-7 & 13 in volume-2 of the bid document]**
17.7.1	Master PLC PanelInternal Wiring Master PLC Panel[Master PLC cum RIO panels painting is RAL 7035 (with interior Brilliant White Glassy Finish) with Ingress Protection of IP-54 conformal coating with sand blasting with Doble Door Glassy Window] inclusive of Latest Hot standby (redundant) Programmable Logical Controller (PLC) CPU,redundant power supply ,redundant communication interface, input/output modules with duplex I/Os for critical I/O's,managed ethernet switches(24 port),to be located in the administration building. Required RIO panels[Min.4 Nos. of RIO-Panels having min. IOs are:DI-1000, DO-500, AI-70 & AO-40] with 15" Color touch screen Panel mounted HMI at various locations in the plant.

Code 17	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 15 MLD capacity plant including TSPS at Hulimavu**
Item	**Description**
17.7.2	Communication Interface Unit (Redundant Communication GPRS with Dual-SIM support) for interfacing data between the STP & ISPS and further transmission to Centralized SCADA of MIS-2, Shimsha Bhavan via the redundant GPRS communication modules through Interface panel at transmission cum receiving end.
17.7.3	Programming software for PLC
17.7.4	SCADA software(Redundant configuration- Min. 10,000 Tags licensed without any time bound)
17.7.5	Historian software (Min. 1000 Tags licensed without any time bound)
17.7.6	Managed Industrial grade Ethernet switches(24 port switches)
17.7.7	SCADA Server station loaded with SCADA software embeeded with latest Windows Operating system & MS Office (Compatiable for SCADA Software),32" LED monitors connected Via internal LAN network to SCADA servers.Minimum 2 TB capacity hard drive.
17.7.8	NAS Server for Historian[Dual-coreIntel®2.4GHzProcessor,System memory:4GBDDR3RAM,4 x 2 TB SATA6Gb/s,Hard Drive Tray-8xhot-swappable and lockable tray,LAN Port,Form Factor-2U, Rackmount,Storage Controller-RAID-2,Expansion Slot (PCI-E)-2, LAN Port & LED Indicators]
17.7.9	Historian system work station embeeded with latest Windows Operating system & MS Office (Compatiable for HISTORIAN Software),32" LCD monitors connected Via internal LAN network to servers.Minimum 4 TB capacity hard drive.
17.7.10	Engineering Workstation loaded with PLC Programming cum SCADA Graphics softwares [embeeded with latest Windows Operating system & MS Office (Compatiable for PLC cum SCADA Software)],32" LED monitors connected Via internal LAN network to SCADA servers.Minimum 2 TB capacity hard drive.
17.7.11	Latest Laptop (16 inches FHD, Intel I5-13th Generation, 32-GB RAM,1 TB SSD) for online & offline PLC Programming cum diagnostics for communication checks for each RIO panel etc..
17.7.12	LED SCREENS , 55" in array of 2X3 (total 6 monitors) networked with SCADA servers to display the SCADA screens,CCTV Feeds,with all required hardware & software accessories
17.7.13	Control system console for the SCADA server machines,engineering & operator stations,Historian system,CCTV system[For Min., 5-Operator workstations, Printer & Laptop with industrial Grade consoles with chairs]
17.7.14	**Redundant UPS:** 20 KVA on line UPS system as per IEC 62040-I (Safety), IEC 62040-3 (Performance) for critical IT solutions, fully digital IGBT Converter and Inverter, SCR rectifier with Internal /External isolation transformer from DC to AC, PWM, pure sine wave output, double conversion, output pf 0.8, with paralleling facility, standard communication features/options auto and manual static by pass switch three phase input / Three phase output. acoustic level shall be less than 58dB at 1 mtr distance.**Battery:-** Supply and fixing of 12V, 200 AH Tubular battery including wire leads.
17.7.15	Multifunction Color & BW Laser printer-A3 & A4 size and networked with SCADA system
17.7.16	CCTV System
17.7.17	Armoured Instrumentation Cables(Power, Signal & Control) for the plant

Code 17	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 15 MLD capacity plant including TSPS at Hulimavu**
Item	**Description**
17.7.18	4 nos. of Copper earth pits for each RIO Panel (as per IS - 3043 using 600 X 600 X 3 mm copper earth plate) complete with accessories and hinged cover earthing system and also equipment body earthing of Plant SCADA control room, using 25 X 6 mm copper strip.
17.7.19	GI perforated cable tray with cover along with required angle supports, with coupler plates, Anchor bolts and nuts etc complete and the tray should be fitted on the wall / Ceiling etc. complete. For all instrummnetaiton cables
17.7.20	Field Enclosures having IP-65 for Filed Instruments
17.7.21	Surge Protection Devices (SPDs)
17.7.22	Field Analog Junction boxes
17.7.23	Field Power Junction boxes
17.7.24	Single Mode Redundant Fibre Optic Cable (FOC) for interfacing between Master PLC & each RIO Panel [Which includes HDPE pipes]
17.7.25	**Fire Alarm & Suppression System**
17.7.25.1	Addressable peer to peer Networkable analogue addressable type fire alarm control panel with minimum 1500 Character / 240X64 Pixel / 7inch Touchscreen graphic LCD display. The panel should be equipped with sufficient numbers of loop with 20% spare capacity, with each networkable intelligent fire alarm Control Panel having SLC with capacity of min 250 detectors/ devices in any combination (Min 120 Detector) with key pad, dual flash-based microprocessor technology, inbuilt USB Port for upload and down load the configuration tools, RS232 serial port for direct PC or modem connection, inbuilt NAC's, min 20 programmable Zonal LEDs and operates on 240V AC + 10% with 50 Hz with built in charger. The panel shall have fire, fault relays, option of BMS integration MODBUS/ BACKNET, graphical software for provision of TCP/ IP modules, Remote Access, Class 'X' wiring with provision of both class 'A' and class 'B' wiring in the SLC circuit, user friendly with communication facility to monitor & control the FACPs from a single window. The Panel shall be suitable for minimum of 5000 event record facility, event fetch from FACP facility and the single panel shall be suitable for min 2000 fire zones and 200 Panels/ Nodes in one network with all other accessories required to successfully run the system. The panel shall be completed as per UL and FM/EN54 & VDS standards (The System cost shall be included of all necessary cards, modules, Panel enclosure, CPU and associated accessories to complete the system design)
17.7.25.2	Analogue Addressable loop powered Sounder & Beacon with inbuilt isolator and having Min 15 distinct sound patterns/ multitone to indicate Exit doors and direct occupants for safe and fast evacuation and 100dB output with minimum 1Hz Frequency flash rate designed for IP65 requirements and approved to operate in –10°C to +55°C temperature, complies with the essential requirement of the EMC Directive to be supplied with Junction Box, Glands and other mounting accessories for proper installation.
17.7.25.3	Dust and Vermin proof (Resettable) addressable analogue Manual call boxes along with Isolators inbuilt having front reset mechanism with 170° viewable LED and can be viewed from the distance of 7 M. also have inbuilt isolator having operating temperature from -40°C-70°C to initiate audio visual alarm in case of Human detection of fire. The manual call point must be indoor type with IP 44 rating. The call point must be resettable type without break glass.

Code 17	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 15 MLD capacity plant including TSPS at Hulimavu**
Item	**Description**
17.7.25.4	Optical smoke detector with LED with standard base having capacity of min 126 address combination. Operating temperature -40°C to 70°C &Humidity 0-95%. The detector should have polling 360-degree viewable LED with 5 class approved response modes all approved with the relevant standards, drift compensation and transient rejection. The detector shall have facility to mount in different comprehensive environment like Hostile environment, precious storage, Warehouse and normal working environments. The detector should have a self-locking mechanism and requires a special tool to remove this detector. The detector should have a hard address inside the base. The detector must have nonvolatile memory to write the installation date & site codes. The detector should be made of fire-retardant material & should be melt above 100-degree C. The detectors must be openable for the cleaning of dust whenever required. All the other specs should be as per the specification attached.
17.7.25.5	Analogue Addressable Multi-sensor (Smoke & Heat) detector with LED with standard base having capacity of min 126 address combination. Operating temperature -40°C to 70°C & Humidity 0-95%. The detector should have polling 360-degree viewable LED with 5 class approved response modes all approved with the relevant standards, drift compensation and transient rejection. The detector should trigger heat alarm as per the A1R class requirement. The detector shall have facility to mount in different comprehensive environment like Hostile environment, Parking Garage, Precious storage, Ware house and normal working environments. The detector should have a self-locking mechanism and requires a special tool to remove this detector. The detector should have a hard address inside the base. The detector should be made of fire-retardant material & should be melt above 100-degree C. The detectors must be open for the cleaning of dust whenever required. The detector must have 4 nonvolatile memories to write the installation date & site codes
17.7.25.6	Analogue addressable Control (Input/Output) module with inbuilt relay and isolator with LED indicator, approved to operate in –10°C to +55°C temperature, complies with the essential requirement of the EMC Directive to be supplied with Junction Box and other mounting accessories for proper installation. In case of Manufacturer with single Input or Output module need to supply One quantity of each for line item.
17.7.26	**Fire Extinguishing System:** ABC stored pressure squeeze grip type fire extinguishers, 9 kg capacity, IS:15683 : 2006, filled with ABC Mono Ammonium Phosphate base powder-90 complete with discharge hose and wall mounting bracket, 2mm Mild Steel, EPDM Rubbers, Pressure Gauge, which work effectively on all class of fires (A, B, C & Electrical fires) with 5 years warranty Including transportation, all taxes and all labour charges etc complete.
17.7.27	2.0 TR Split AC, 3 Star capable of delivering not less than 21600 BTU/hr and above with operating on refrigerant R-410A / R-32, supply for SCADA control Room 2Nos and 1 for each RIO panel.
17.7.28	**Communication Interface Equipment**
17.7.28.1	Interoperability test in co-ordination with Communication Interface Unit (Redundant Communication GPRS with Dual-SIM support) for interfacing data between the STP & ISPS and further transmission to Centralized SCADA of MIS-2, Shimsha Bhavan via the redundant GPRS communication modules through Interface panel at transmission cum receiving end.
17.7.29	**Spares to be provided for the control system on a minimum during commissioning.**
17.7.29.1	Central Processing Unit(CPU)
17.7.29.2	Digital Input Module (32-Channels)

Code 17	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 15 MLD capacity plant including TSPS at Hulimavu**
Item	**Description**
17.7.29.3	Digital Output Module (32-Channels)
17.7.29.4	Analog Input Module (16-Channels)
17.7.29.5	Analog output module (8-Channels)
17.7.29.6	Managed ethernet switch(24 Port)
17.7.29.7	Communication Module (RIO)
17.7.30	Any other item & accessories not specified above but required to complete the work. Note: 1. Contractor shall list down all equipment with breakup of item, quantity and include the total price of these items. 2. Items not listed and required for completing the job shall be done by contractor without any additional payment.
17.7.31	**The Bidder shall list here details of any additional items required for a complete installation**

Code 20	**Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
Item	**Description**
20	**Civil and Building Works**
20.1	**TSPS Works**
20.1.1	Inlet manhole & chamber, Coarse Screen channels, Effluent chamber, Overflow chamber, Wetwell with superstructure, Valve & Flowmeter chambers, Thrust block and Anchor blocks etc.
20.2	**Inlet Works**
20.2.1	Inlet Chamber, Fine Screen Channel, Screen Effluent/ Grit Basin Distribution Channel, chambers, RCC Staircase, etc.
20.2.2	Vortex Grit Basins & chamber, Grit Basin effluent channel, Grit Classifier arrangement,chambers, RCC Staircase, etc.
20.2.3	Parshall Flume, drop chamber, connecting arrangement from Inlet works to Areation basin, RCC Staircase etc
	OR
20.2.4	Suitable foundations and supporting structure for Combi Unit consisting of Stainless steel fabricated unit which includes Fine Screening arrangement with conveyor system and Grit Mechanism along with conveyor,Screening and Grit collection arrangement.
20.3	**Treatment Units**
20.3.1	Aeration Basin flow distribution channel, Anaerobic Zones, Anoxic Zones, Aerobic Zones, Aeration Basin Effluent Channel, MLR Feed, RAS inlet arrangement, Valve & flowmeter chamber, Overflow & Bypass chamber, RCC Staircase, etc. Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit and Sump pump, Desluding valve chamber, RCC Staircase etc. RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
	OR
20.3.2	SBR Tank, Selector Zone or without Selector zone, SBR Decanting System and fixing arrangements for Sluice gates and weir gates,Scum collection pit and Sump pump, Stop logs, flushing arrangementand all allied works complete
20.4	**BLOWER BUILDING**
20.4.1	Process Air Blower Building, Valve chamber, Supports for air piping,RCC Stair case etc.
20.5	**PRIMARY CLARIFIERS**
20.5.1	Flow Distribution Box, Plate Settlers
20.6	**SECONDARY CLARIFIERS**
20.6.1	Inlet arrangments from areation basin outlet, Secondary Clarifier Distribution boxes, Secondary Clarifiers, Scum collection pit, Desluding valve chamber, RCC Staircase etc.
20.6.2	RAS pumping station including Valve & flowmeter chambers, RCC Staircase, etc.
20.7	**Chlorine Contact Tank**
20.7.1	Chlorine Contact Tank, Inlet chamber, distribution chamber, Effluent Channel/pipe, flowmeter chamber, RCC Staircase, Outfall Structure, etc
20.7.2	Chlorine and Alum building etc and any other chemicals required as per the Process design, etc.
20.7.3	Plant water & Treated water storage sump / Pump Station and inlet flow arrangement, chamber etc.
20.8	**Disc Filter**
20.8.1	Disc Filter Influent chamber, Disc Filter units and Disc Filter Effluent channel, Backwash water collection arrangement etc.
20.9	**SLUDGE DEWATERING**
20.9.1	Sludge Dewatering Building including sludge storage, chambers etc.
20.9.2	Dewatering Feed sump and Pumping Station, chambers etc.
20.9.3	Scum Pit,Sump and Pump Station, Chamber etc.
20.9.4	Plant Drain Sump and Pump Station, Chamber etc.
20.9.5	Solar Sludge Dryer
20.9.6	Sludge Thickened Building
20.9.7	Anaerobic Sludge Digestor
20.9.8	Digestor Building
20.9.9	Primary Sludge Pump House
20.10	**BIOGAS POWER GENERATION**
20.10.1	Bio Gas Storage Tank

Code 20	**Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
Item	**Description**
20.10.2	Bio Gas Scrubbing Blower Building
20.10.3	Bio Gas Engine Building
20.11	**SUBSTATION FOR STP & TSPS**
20.11.1	Switch gear room, Electrical Sub station
20.11.2	Transformer yard with Chain link fencing and Gates
20.12	**REUSE**
20.120.1	UF Building- above GLR
20.120.2	Industrial Reuse Storage Tank-GLR
20.120.3	Industrial Reuse Pumping Station
20.13	**UTILITY BUILDINGS**
20.13.1	Plant D.G. Room
20.13.2	Administration Cum Laboratory Building & SCADA Building (Two Floors) (For SCADA control room ,refer Particular ICA requirements)
20.13.3	Guard Room (Security Room)
20.13.4	Parking Shed
	OTHER UTILITIES
20.13.5	Internal Roads & stormwater drains and landscaping
20.13.6	Name boards for units in Kannada & English
20.13.7	Approach Road to WwTP, TSPS
20.13.8	Soil Stabilization/Pile foundations/Stone columns/Ground Improvement Plan
20.13.9	GP2, Grouting for machine foundations and base plates
20.13.10	RCC Pre-Cast Compound Wall with gates, Chain link fencing
20.13.11	Site Cleaning, Tree Cutting
20.13.12	Nalla & flow diversion etc.
20.13.13	Gabion wall, Site retaining structure, electric cable trenches inside WwTP site.
20.13.14	Additional Backfill for entire Project including approach road (if required) and Minor Grading
20.13.15	Providing Information Board at Site premises
20.13.16	Tree Plantation
20.13.17	Box culvert/Bridge
20.13.18	Dismantling of existing structures and disposal (if required)
20.14	Any other works which Bidder feels necessary for project completion needs to be added including all essential Investigation, etc. required to complete the Works under 20.1
20.15	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.

Code 21	**Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
Item	**Description**
21	**Mechanical**
21.1	**TSPS**
21.1.1	Inlet & Effluent chambers, Overflow chamber, Screen channels with necessary screening arrangements (Trash & Coarse screen), Solids Grabing unit with monorail arrangement with moving trolley mechanism, Screening Conveyors, Screening collection arrangement, Sluice gates, weir gates and Inlet & Overflow piping with fittings and Hardware with piping and all allied works complete
21.1.2	Wet well with superstructure & Pumping system,Submersible pumps with suitable valves and piping arrangements and Hardware and all allied works complete
21.1.3	Material Handling system with suitable Cranes and hoist arrangements with Hardware and all allied works complete
21.1.4	Miscellaneous works such as flushing arrangements, Grit Removal and dewatering Pumping and ventilation system including Hardware all allied works complete
21.2	**WwTP**
A	**Headworks**
21.2.1	Inlet chamber and Fine Screen Channel, Overflow chamber, Screen Effluent/ Grit Basin Distribution Channel with Sluice gates, weir gates, Stop logs, Inlet & Overflow piping with fittings, flushing arrangement, including Hardware and all allied works complete
21.2.2	Screen chamber with effluent channel, drain piping and Fine screening, Conveyors, Screening collection arrangement, flushing arrangement, including Hardware and all allied works complete
21.2.3	Vortex Grit mechanism with grit classifier & washing mechanism, Conveyors, Grit collection arrangement, sluice gates, Stop logs, flushing arrangement, including Hardware and all allied works complete
	OR
21.2.4	Combi Unit consisting of Stainless steel fabricated unit which includes Fine Screening arrangement with conveyor system and Grit Mechanism along with conveyor,Screening and Grit collection arrangement, Odour control unit with complete system along with suitable Piping and Hardware items
	Primary Treatment Units
21.3	Primary Clarifier system, Inlet & Outlet sluice gates and hardware, Central Drive, Bridge, Scrappers and ancillaries, Tube settler mechanism, Scum withdrawl and pumping arrangement Desludging valves and pipe work, Primary sludge sump and Pumps, valves and Piping and accessories, Hoists & Jib Cranes
21.4	**Secondary Treatment Units**
21.4.1	A2O/Tank,Submersible mixer and Hoisting arrangement With piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete Inlet & outlet piping, Distribution Chamber for Secondary Clarifiers with Inlet & Outlet sluice gates, stoplogs, weir arrangement, flushing arrangement, piping and valves including Hardware and all allied works complete Inlet & Outlet piping, Secondary Clarifiers mechanism, Bridge, scum collection with desludging arrangements,Scum pit and Pumping arrangement,Material Handling Equipment, flushing arrangement, piping and valves including Hardware and all allied works complete.
	OR

Code 21	**Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
Item	**Description**
21.4.2	SBR Tank, Selector Zone or without Selector zone, SBR Decanting System,with piping, Sluice gates and weir gates, Stop logs, flushing arrangement, including Hardware and all allied works complete. Inlet & Outlet piping, Return Activated Sludge Pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Inlet & Outlet piping, Waste Activated Sludge pumping and Pump Station, Submersible pumpsets, Material Handling Equipment,, Hardware with piping, Valves and all allied works complete. Scum collection with desludging arrangements,Scum pit and Pumping arrangement
21.5	Fine Bubble Diffuser Aeration system arrangement, Pipe grid, Drop legs, piping arrangements, Drain pumpsets, Electric hoist, sluice gates, flushing arrangement, Material Handling Equipment, piping and valves including Hardware and all allied works complete
21.6	Process Air Blower Building with blowers, Air Coolers, EOT Crane, Service water & blower cooling arrangement, Piping and valves, Material Handling Equipment, Ventilation system, Hardware and all allied works complete
21.7	Alum solution preparation and dosing which includes minimum of preparation and dosing pumpsets to feed maximum average doses efficiently, agitators, mixing arrangement, flushing arrangement, Channel mounted mixer for alum mixing,Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete including bulk storage tank and containment structure in case of a spill.
21.8	Inlet & Outlet piping, Disc Filter Influent & Effluent chamber sluice gates, Weir gates, Stoplogs, Disc Filter units with chemical cleaning arrangements.Backwash water system and collection arrangement etc and all allied works complete.
21.9	Material pumping station general arrangement,Pumpsets, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping, Valves and all allied works complete
21.10	Chlorine & any other chemical dosing arrangement, spill containment bund, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete
21.11	Inlet & Outlet piping, Chlorine Contact Tank & Outfall structure with sluice gates, weir gates, Stop logs, mixing arrangement, hardware with piping, valves and all allied works complete, Disk filters.
21.12	Reuse works includes Utrafiltration system with Submerged/ Pressurised UF modules and Rack arrangement,Permeate Pumps, Backwash blowers and Pumps, UF Feed Pumps,Caustic dosing system,Citric Acid dosing system and other dosing system as per the process requirement, all type of valves and piping, and Pre filteration, Lifting arrangement, Ventilation system, Electrical and Instrumentation control system for online measuring of all parameters within this Package works along with complete Hardware and supports required for 50% of total WwTP output plant capacity
21.13	Sludge Treatment System, Common Sludge Sump & pumping station, Pre-thickening system, Advanced Sludge Treatment System Equipments & accessories, Process Unit Equipments for advanced sludge treatment system, Ancillary Building Equipments for advanced sludge treatment system, Others, bidders to specify.
21.14	Anearobic Digester System, Digester Gas mixing Blowers, Digester Sludge mixing Pumps, Digester Sludge Recirculation feed Pumping system, Heat Exchanger System, Digester Gas mixing injection system, Safety Devices for Digester, Digester sludge heating system (Hot water Boiler & Pumps), Hot water Boiler system, Sludge/Biogas Storage tank system, Material Handling Equipment, Ventilation system, Hardware with piping, Valves and all allied works complete

Code 21	**Works-A (Lumpsum) - Supply and Installation of Mechanical Works for WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
Item	**Description**
21.15	Dewatering feed pumping system, Submersible mixer arrangement, Sludge feed Pumpsets, flushing arrangement, Ventilation system, Material Handling Equipment and Hardware with piping, valves and all allied works complete
21.16	Polyelectrolyte dosing systems for sludge dewatering, stirrer arrangement, feeding arrangement, Preparation & Storage tanks, Dosing Pumpsets, flushing arrangement, Material Handling Equipment, Ventilation system, Hardware with piping and all allied works complete
21.17	Bio-Gas Treatment, Bio-Gas Scrubbing system with Caustic recovery facility complete with Blowers, Dosing system and accessories, Gas Flare complete assembly, Gas Flare complete assembly, Safety Devices
21.18	Sludge dewatering units, sludge cake conveying system with cut gate arrangement and hopper & Collection system, Material Handling Equipment for sludge dewatering units, flushing arrangement, Ventilation system, Hardware with piping and all allied works complete
21.19	Inlet & Outlet piping, Plant Drain Sump and Pump Station, Submersible pumpsets, Material Handling Equipment, Hardware with piping, Valves and all allied works complete
21.20	Inlet & Outlet piping, Treated water storage Pump Station, Submersible pumpsets, Material Handling Equipment, Hardware with piping, Valves and all allied works complete
21.21	Inlet & Outlet piping, Plant water Pump Station, Submersible pumpsets, Material Handling Equipment, Sluice gates, Weir gates, Stop log gates,Hardware with piping, Valves, All Plant Piping works and all allied works complete
21.22	Flushing arrangement for all chemical & Sludge Material Handling systems, Dewatering Pumps including piping and all allied works in all sludge & Chemical Material Handling pump houses complete
21.23	Service water system including pumps with Hardware, piping, Valves and all allied works complete
21.24	Fire Fighting system for the whole plant (inclusive of fire alarm,fire detection,fire extinguishing system), Tools Kit, Air conditioning system for SCADA control room & Administration and Laboratory Building and all allied works complete.
21.25	Any other works which Bidder feels necessary for project completion needs to be added including all essential Investigation, etc. required to complete the Works under 1.3
21.26	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.

Code 22	**Works-A (Lumpsum) - Supply and Installation of Electrical Works for WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
Item	**Description**
22	**Electrical Systems [Refer Parts-6 & 12 in volume-2 of the bid document]**
22.1	**11kV underground Cables, Termination Kits at following locations as per scope, specification and drawings.**
22.1.1	11kV Outdoor cable termination at Tariff Metering Unit / BESCOM
22.1.2	11kV Outdoor cable termination at incomer and outgoings of 11kV Point of Supply Breaker (VCB)
22.1.3	11kV Indoor cable terminations at incomer and outgoings of 11kV Metal Enclosed Switchboard of Wastewater Treatment Plant
22.1.4	11kV Indoor cable terminations at incomer and outgoings of 11kV ICOG Panels (Process Air Blowers) of Wastewater Treatment Plant
22.1.5	11kV Outdoor cable terminations at primary side of 11kV / 0.433 kV Transformers of Wastewater Treatment Plant
22.1.6	11kV Outdoor cable terminations at primary side of 11kV / 0.433 kV Transformers (Process Air Blower) Wastewater Treatment Plant
22.1.7	11kV XLPE Cable from Metering Unit to incomer of 11kV Point of Supply Breaker (VCB)
22.1.8	11kV XLPE Cable from 11kV Point of Supply Breaker (VCB) to incomer of 11kV Metal Enclosed Switchboard of Wastewater Treatment Plant
22.1.9	11kV XLPE Cable from 11kV Metal Enclosed Switchboard of Wastewater Treatment Plant to 11kV ICOG (Process Air Blowers)
22.1.10	11kV XLPE Cables from 11kV Metal Enclosed Switchboard to Primary cable end boxes of 11kV/0.433kV Transformers of Wastewater Treatment Plant
22.1.11	11kV XLPE Cables from 11kV ICOG (Process Air Blower) to Primary cable end boxes of 11kV/0.433kV Transformers of Process Air Blowers
22.1.12	11kV Cable Straight through joints
22.2	**Electrical equipments at Wastewater Treatment Plant Substation Building & Process Air Blower Building as per scope, specification and drawings.**
22.2.1	11kV Point of Supply Breaker (VCB) / ICOG Panel
22.2.2	11kV Metal Enclosed Switchboard
22.2.3	11kV ICOG Panels (Process Air Blower)
22.2.4	Diesel Generator Set complete with AMF Control Panel
22.2.5	11kV / 0.433kV Transformers (Wastewater Treatment Plant)
22.2.6	11kV / 0.433kV Transformers (Process Air blowers)
22.2.7	LT Non Segregated Aluminium Bus ducts with necessary supporting structure
22.2.8	415V Switchgear PCC (Wastewater Treatment Plant)
22.2.9	415V Switchgear PCC (Process Air blowers)
22.2.10	415V Capacitor banks with Automatic Power Factor Correction Relay
22.2.11	110V D.C Battery Bank, Battery Charger with D.C Distribution Board
22.3	**Motor Control Centers , Distribution boards etc of Motor Control Centres, Distribution boards etc at various locations in TSPS & Wastewater Treatment Plant with following major equipment, items as per scope, specification and drawings.**
22.3.1	TSPS MCC
22.3.2	Headworks MCC
22.3.3	Centrifuge MCC
22.3.4	RAS MCC
22.3.5	Chlorine MCC
22.3.6	Main Lighting DB
22.3.7	Variable Frequency Drives
22.3.8	Bio-Gas MCC Panel
22.3.9	Digester MCC Panel

Code 22	**Works-A (Lumpsum) - Supply and Installation of Electrical Works for WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
Item	**Description**
22.3.10	Local Push Button Stations
22.3.11	Motorized Valve DBs (MOV DBs)
22.3.12	Exhaust Fans DB / Ventilation Fan DB
22.3.13	Power Distribution Board (PDB) / AC Distribution Board
22.4	**Lighting System at TSPS & Wastewater Treatment Plant with following major equipment, items as per scope, specification and drawings.**
22.4.1	Indoor Lighting Fixtures
22.4.2	Outdoor Lighting Fixtures
22.4.3	Emergency Light Fixtures
22.4.4	Lighting panels
22.4.5	Switchboards, Receptacles, Power Plug & Sockets, Switches, Ceiling fans with regulators etc
22.4.6	Point wiring with conduits, wires, supports etc for Lighting fixtures, Receptacles, Ceiling fans etc
22.4.7	Street Lighting and Area Lighting poles with Junction boxes and Over hang
22.5	**L.T Cabling System, HT/LT Cable Carrier System of L.T Cabling System, HT/LT Cable Carrier System at TSPS & Wastewater Treatment Plant with following major components as per scope, specification and drawings.**
22.5.1	L.T cables
22.5.2	L.T Cable termination with glands and lugs
22.5.3	Cable trays on supports for both LT and HT Cables
22.5.4	Hume Pipe
22.6	**Earthing & Lightning Protection System of Earthing & Lighting Protection System at TSPS & Wastewater Treatment Plant with following major components as per scope, specification and drawings.**
22.6.1	Earthing Conductor for outdoor main grid
22.6.2	Earthing Conductor for indoor main grid
22.6.3	Earthing Conductors for outdoor equipments and Junction Boxes
22.6.4	Lightning Protection system with Vertical Air Termination network with fixing system, horizontal conductors, roof conductors along with holders, connectors, Down Conductors, test link boxes, lightning earth electrodes etc.
22.6.5	Earthing Conductor for indoor equipments
22.6.6	Earth pits
22.7	**Safety procedures with Signage for Electrical Equipments at TSPS & Wastewater Treatment Plant as per scope, specification and drawings.**
22.8	**The bidder shall list here details of any additional items required for a complete installation**

Code 23	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
Item	**Description**
23	**Instrumentation Systems**
23.1	**Instrumentation Systems as per Technical Specifications [Refer Parts-7 & 13 in volume-2 of the bid document]**
23.1.1	Open channel flow measurement with Transmitter's along with required accessaries and fittings for open channel flow measurement for the complete Wwtp. The flow meter shall be Interfaced with Plant PLC / SCADA Control system.Refer Parts-7 & 13 in volume-2 of the bid document.
23.1.2	Air Flow Measuring System (Thermal mass flowmeter cum transmitter's common discharge of each air blowers's), Air pressure Measuring System with transmitter (at common discharge of each air blowers's) & Temperature Measuring System with transmitter (at common discharge of each air blowers's) along with the required accessories & fittings for the complete Wwtp.Refer Parts-7 & 13 in volume-2 of the bid document.
23.1.3	Temperature Gauges for Air Temperature Indications pertating to individual discharge of each air blower
23.1.4	Thermal Mass Flow Measurement for bio-gas medium (Bio-Gas Mixing Blowers, Biogas Engine, Hotwater Boilers & Biogas flare) including all other installation accessories etc.
23.1.5	Temperature Indicating Transmitter-TIT (Sensor with Thermowell including all other installation accessories etc.) for continuous Temperature measurement at Anaerobic Sludge Digestor, Bio-gas holder, Hot Water Boliers, Heat Exchangers, Digestor Sludge Recirculation Pumps, Biogas Scrubbing Blowers etc.
23.1.6	Electromagnetic Flowmeter's with Indicating Transmitter's with totalizer (full bore type) with flange Ends, rates shall be inclusive of mating flanges with necessary fasteners and gaskets, for the complete WwTP. The flow meter shall be Interfaced with PLC based scada control system.Refer Parts-5,7 & 13 in volume-2 of the bid document.
23.1.7	Level Transmitter's with indicators & alarms as required including all required Mounting accessories for the complete WwTP and Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
23.1.8	Differential Level Sensor's & Transmitter's with indicators & alarms as required including all required Mounting accessories for the complete WwTP. and Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
23.1.9	Conductivity type Level Switches (back up to level transmitter), High Level & Low Level sensing (with 4 point contact) with necessary instrumentation cabling,glands with suitable stub and flange and bolting arrangement for hook-up, for the complete WwTP and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
23.1.10	Float type Level Gauges with necessary instrumentation cabling,glands with suitable stub and flange and bolting arrangement for hook-up,for the complete WwTP and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
23.1.11	Pressure Transmitter's with necessary instrumentation cabling,manifold,glands and conduit with suitable stub and flange and bolting arrangement for hook-up, for the complete WwTP. and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.
23.1.12	Pressure Switches on the pump discharge with necessary instrumentation cabling, glands and conduit with suitable stub and flange and bolting arrangement for hook-up, Pressure switch and also Interfacing with PLC based scada control system.Refer Parts-7 & 13 in volume-2 of the bid document.

Code 23	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
Item	**Description**
23.1.13	Glycerine filled stainless steel pressure gauges (for individual pump / blower discharge) of 150 mm Dia. Dail with nipple, snubber for vibration resistance and necessary length of SS tubing suitable for mounting , including isolating valve for maintenance etc.,complete with all lead and lifts etc, for the complete WwTP.Refer Parts-7 & 13 in volume-2 of the bid document.
23.2	**Online Analytical Instruments as per Technical Specifications[Refer Parts-5,7 & 13 in volume-2 of the bid document]**
23.2.1	Dissolved Oxygen Analyzer + Accessories + fittings
23.2.2	ORP Analyzer's+ Accessories + fittings
23.2.3	pH Analyzer+ Accessories + fittings
23.2.4	Conductivity Analzyer+ Accessories + fittings
23.2.5	Residual Chlorine Analyzer+ Accessories +fittings
23.2.6	MLSS Analyzer-+ Accessories+ Fittings
23.3	**Online Real Time Multi Parameters Continuous Monitoring System for Influent and Treated Sewage Parameters & AutoSamplers[Refer Parts-5,7 & 13 in volume-2 of the bid document]**
23.3.1	All weather refrigerated Auto sampler's
23.3.2	Real time Multi Parameters Continuous Monitoring System for Influent and Treated Sewage Parameters at Inlet & outlet of STP to measure the following parameters (Refer Parameter list in Part-5, Volume-2 of the Bid Document) and communication modules to transmit the data to SCADA system,CPCB and KSPCB data centers as and when required.
23.4	**Lab Instruments with required chemicals & reagents**
23.4.1	Comparator test set for residual chlorine or chloroscope
23.4.2	Multi Parameter (pH & Conductivity Meter)
23.4.3	Mains operated pH meter completed with one calomel electrode and glass electrode
23.4.4	Turbidimeter-Bench Model (Nephelometric Type)
23.4.5	Turbidimeter-Hand held (Portable)
23.4.6	Spectrophotometer
23.4.7	Water bath with 6 to 8 concentric holes and discs, electrically heated
23.4.8	Soxhlet extraction unit
23.4.9	Kjeldahl digestion unit
23.4.10	Hot plates
23.4.11	Distilled water plant
23.4.12	Demineraliser
23.4.13	Refrigerator (320 litres capacity) double door
23.4.14	B.O.D. incubator
23.4.15	Muffle furnace
23.4.16	Electric Oven
23.4.17	Magnetic Stirrer
23.4.18	Monopan balance with digital display
23.4.19	Jar-Test apparatus with RPM controller and simultaneous addition of Chemicals in all jars(Phipps & Bird)
23.4.20	Centrifuge
23.4.21	Gas cylinder if gas supply is not available
23.4.22	Fume cupboard/hood
23.4.23	Field test kit for cations and anions
23.4.24	Depth sampler

Code 23	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
Item	**Description**
23.4.25	Online Total organic carbon analytical analyser
23.4.26	Sieve shaker with standard sieves and Two pan balance, weighing up to 200gm samples
23.4.27	Electronic Weighing Balance (Max. 10 kg)
23.4.28	Durham tubes and Imhoff cones (1 lot)
23.4.29	D.O meter
23.4.30	Specific Gravity Meter (1.0~1.1 and 1.2~1.3)
23.4.31	Consumables – disposable & reusable type
23.4.32	LIMS Software for Laboratory Equipments
	Equipment Needed For Bacteriological Examination
23.4.33	Hot Air Oven
23.4.34	Autoclave
23.4.35	Incubator 37C or 44C (Water/Air-Jacketed)
23.4.36	Binocular Microscope
23.4.37	Digital pH Meter
23.4.38	Pipette Box (Stainless Steel)
23.4.39	Wooden Racks/Aluminium Racks
23.4.40	Wire Baskets
23.4.41	Cotton/Aluminium Foils
23.4.42	Burners (Bunsen) with Pilot Lamp
23.4.43	Suction Flask (1 Ltr. Cap)
23.4.44	Suction Pump
23.4.45	Sampling Bottles
23.4.46	Measuring Cylinders
23.4.47	Vacuum Pump
23.5	**Bacteriological Media**
23.5.1	M. Endo Broth (dehydrated)
23.5.2	Lactose or Lauryl Tryptose
23.5.3	Mac Conkey broth
23.5.4	Brilliant Green Bile Lactose Broth
23.5.5	Total Plate Count Agar
23.5.6	Peptone/Triyptone Water
23.5.7	Portable Density Meter
23.6	**Instrumentation Cables/cable trays as per Technical Specification [Refer Parts-7 & 13 in volume-2 of the bid document]**
23.6.1	Suppying of Instrumentation & Control Cables and Power Cables, OFC, Glands & Lugs, cable conduits ,etc as required to complete the entire Instrumentation,control and automation system ,required as per specifications
23.6.2	Supplying and installation of cable tray's with cover along with required angle supports, with coupler plates, Anchor bolts and nuts etc complete and the tray should be fitted on the wall / ceiling etc. complete for all instrumentation cables
23.7	**Control & Automation System [Refer Parts-7 & 13 in volume-2 of the bid document]**

Code 23	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
Item	**Description**
23.7.1	Internal Wiring Master PLC Panel[Master PLC cum RIO panels painting is RAL 7035 (with interior Brilliant White Glassy Finish) with Ingress Protection of IP-54 conformal coating with sand blasting with Doble Door Glassy Window] inclusive of Latest Hot standby (redundant) Programmable Logical Controller (PLC) CPU,redundant power supply ,redundant communication interface, input/output modules with duplex I/Os for critical I/O's,managed ethernet switches(24 port),to be located in the administration building. Required RIO panels[Min.4 Nos. of RIO-Panels having min. IOs are:DI-2500, DO-1000, AI-100 & AO-50] with 15" Color touch screen Panel mounted HMI at various locations in the plant.
23.7.2	Communication Interface Unit (Redundant Communication GPRS with Dual-SIM support) for interfacing data between the STP & ISPS and further transmission to Centralized SCADA of MIS-2, Shimsha Bhavan via the redundant GPRS communication modules through Interface panel at transmission cum receiving end.
23.7.3	Programming software for PLC
23.7.4	SCADA software(Redundant configuration- Min. 10,000 Tags licensed without any time bound)
23.7.5	Historian software (Min. 1000 Tags licensed without any time bound)
23.7.6	Managed Industrial grade Ethernet switches(24 port switches)
23.7.7	SCADA Server station loaded with SCADA software embeeded with latest Windows Operating system & MS Office (Compatiable for SCADA Software),32" LED monitors connected Via internal LAN network to SCADA servers.Minimum 2 TB capacity hard drive.
23.7.8	NAS Server for Historian[Dual-coreIntel®2.4GHzProcessor,System memory:4GBDDR3RAM,4 x 2 TB SATA6Gb/s,Hard Drive Tray-8xhot-swappable and lockable tray,LAN Port,Form Factor-2U, Rackmount,Storage Controller-RAID-2,Expansion Slot (PCI-E)-2, LAN Port & LED Indicators]
23.7.9	Historian system work station embeeded with latest Windows Operating system & MS Office (Compatiable for HISTORIAN Software),32" LCD monitors connected Via internal LAN network to servers.Minimum 4 TB capacity hard drive.
23.7.10	Engineering Workstation loaded with PLC Programming cum SCADA Graphics softwares [embeeded with latest Windows Operating system & MS Office (Compatiable for PLC cum SCADA Software)],32" LED monitors connected Via internal LAN network to SCADA servers.Minimum 2 TB capacity hard drive.
23.7.11	Latest Laptop (16 inches FHD, Intel I5-13th Generation, 32-GB RAM,1 TB SSD) for online & offline PLC Programming cum diagnostics for communication checks for each RIO panel etc.
23.7.12	LED SCREENS , 55" in array of 2X3 (total 6 monitors) networked with SCADA servers to display the SCADA screens,CCTV Feeds,with all required hardware & software accessories
23.7.13	Control system console for the SCADA server machines,engineering & operator stations,Historian system,CCTV system[For Min., 5-Operator workstations, Printer & Laptop with industrial Grade consoles with chairs]

Code 23	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
Item	**Description**
23.7.14	**Redundant UPS:** 20 KVA on line UPS system as per IEC 62040-I (Safety), IEC 62040-3 (Performance) for critical IT solutions, fully digital IGBT Converter and Inverter, SCR rectifier with Internal /External isolation transformer from DC to AC, PWM, pure sine wave output, double conversion, output pf 0.8, with paralleling facility, standard communication features/options auto and manual static by pass switch three phase input / Three phase output. acoustic level shall be less than 58dB at 1 mtr distance.**Battery:-** Supply and fixing of 12V, 200 AH Tubular battery including wire leads.
23.7.15	Multifunction Color & BW Laser printer-A3 & A4 size and networked with SCADA system
23.7.16	CCTV System
23.7.17	Armoured Instrumentation Cables(Power, Signal & Control) for the plant
23.7.18	4 nos. of Copper earth pits for each RIO Panel (as per IS - 3043 using 600 X 600 X 3 mm copper earth plate) complete with accessories and hinged cover earthing system and also equipment body earthing of Plant SCADA control room, using 25 X 6 mm copper strip.
23.7.19	GI perforated cable tray with cover along with required angle supports, with coupler plates, Anchor bolts and nuts etc complete and the tray should be fitted on the wall / Ceiling etc. complete. For all instrummnetaiton cables
23.7.20	Field Enclosures having IP-65 for Filed Instruments
23.7.21	Surge Protection Devices (SPDs)
23.7.22	Field Analog Junction boxes
23.7.23	Field Power Junction boxes
23.7.24	Single Mode Redundant Fibre Optic Cable (FOC) for interfacing between Master PLC & each RIO Panel [Which includes HDPE pipes]
23.7.25	**Fire Alarm & Suppression System**
23.7.25.1	Addressable peer to peer Networkable analogue addressable type fire alarm control panel with minimum 1500 Character / 240X64 Pixel / 7inch Touchscreen graphic LCD display. The panel should be equipped with sufficient numbers of loop with 20% spare capacity, with each networkable intelligent fire alarm Control Panel having SLC with capacity of min 250 detectors/ devices in any combination (Min 120 Detector) with key pad, dual flash-based microprocessor technology, inbuilt USB Port for upload and down load the configuration tools, RS232 serial port for direct PC or modem connection, inbuilt NAC's, min 20 programmable Zonal LEDs and operates on 240V AC + 10% with 50 Hz with built in charger. The panel shall have fire, fault relays, option of BMS integration MODBUS/ BACKNET, graphical software for provision of TCP/ IP modules, Remote Access, Class 'X' wiring with provision of both class 'A' and class 'B' wiring in the SLC circuit, user friendly with communication facility to monitor & control the FACPs from a single window. The Panel shall be suitable for minimum of 5000 event record facility, event fetch from FACP facility and the single panel shall be suitable for min 2000 fire zones and 200 Panels/ Nodes in one network with all other accessories required to successfully run the system. The panel shall be completed as per UL and FM/EN54 & VDS standards (The System cost shall be included of all necessary cards, modules, Panel enclosure, CPU and associated accessories to complete the system design)

Code 23	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
Item	**Description**
23.7.25.2	Analogue Addressable loop powered Sounder & Beacon with inbuilt isolator and having Min 15 distinct sound patterns/ multitone to indicate Exit doors and direct occupants for safe and fast evacuation and 100dB output with minimum 1Hz Frequency flash rate designed for IP65 requirements and approved to operate in –10°C to +55°C temperature, complies with the essential requirement of the EMC Directive to be supplied with Junction Box, Glands and other mounting accessories for proper installation.
23.7.25.3	Dust and Vermin proof (Resettable) addressable analogue Manual call boxes along with Isolators inbuilt having front reset mechanism with 170° viewable LED and can be viewed from the distance of 7 M. also have inbuilt isolator having operating temperature from -40°C-70°C to initiate audio visual alarm in case of Human detection of fire. The manual call point must be indoor type with IP 44 rating. The call point must be resettable type without break glass.
23.7.25.4	Optical smoke detector with LED with standard base having capacity of min 126 address combination. Operating temperature -40°C to 70°C &Humidity 0-95%. The detector should have polling 360-degree viewable LED with 5 class approved response modes all approved with the relevant standards, drift compensation and transient rejection. The detector shall have facility to mount in different comprehensive environment like Hostile environment, precious storage, Warehouse and normal working environments. The detector should have a self-locking mechanism and requires a special tool to remove this detector. The detector should have a hard address inside the base. The detector must have nonvolatile memory to write the installation date & site codes. The detector should be made of fire-retardant material & should be melt above 100-degree C. The detectors must be openable for the cleaning of dust whenever required. All the other specs should be as per the specification attached.
23.7.25.5	Analogue Addressable Multi-sensor (Smoke & Heat) detector with LED with standard base having capacity of min 126 address combination. Operating temperature -40°C to 70°C & Humidity 0-95%. The detector should have polling 360-degree viewable LED with 5 class approved response modes all approved with the relevant standards, drift compensation and transient rejection. The detector should trigger heat alarm as per the A1R class requirement. The detector shall have facility to mount in different comprehensive environment like Hostile environment, Parking Garage, Precious storage, Ware house and normal working environments. The detector should have a self-locking mechanism and requires a special tool to remove this detector. The detector should have a hard address inside the base. The detector should be made of fire-retardant material & should be melt above 100-degree C. The detectors must be open for the cleaning of dust whenever required. The detector must have 4 nonvolatile memories to write the installation date & site codes
23.7.25.6	Analogue addressable Control (Input/Output) module with inbuilt relay and isolator with LED indicator, approved to operate in –10°C to +55°C temperature, complies with the essential requirement of the EMC Directive to be supplied with Junction Box and other mounting accessories for proper installation. In case of Manufacturer with single Input or Output module need to supply One quantity of each for line item.
23.7.26	**Fire Extinguishing System:** ABC stored pressure squeeze grip type fire extinguishers, 9 kg capacity, IS:15683 : 2006, filled with ABC Mono Ammonium Phosphate base powder-90 complete with discharge hose and wall mounting bracket, 2mm Mild Steel, EPDM Rubbers, Pressure Gauge, which work effectively on all class of fires (A, B, C & Electrical fires) with 5 years warranty Including transportation, all taxes and all labour charges etc complete.

Code 23	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for WwTP of 35 MLD capacity plant including TSPS at Anjanapura**
Item	**Description**
23.7.27	2.0 TR Split AC, 3 Star capable of delivering not less than 21600 BTU/hr and above with operating on refrigerant R-410A / R-32, supply for SCADA control Room 2Nos and 1 for each RIO panel.
23.7.28	**Communication Interface Equipment**
23.7.28.1	Interoperability test in co-ordination with Communication Interface Unit (Redundant Communication GPRS with Dual-SIM support) for interfacing data between the STP & ISPS and further transmission to Centralized SCADA of MIS-2, Shimsha Bhavan via the redundant GPRS communication modules through Interface panel at transmission cum receiving end.
23.7.29	**Spares to be provided for the control system on a minimum during commissioning.**
23.7.29.1	Central Processing Unit(CPU)
23.7.29.2	Digital Input Module (32-Channels)
23.7.29.3	Digital Output Module (32-Channels)
23.7.29.4	Analog Input Module (16-Channels)
23.7.29.5	Analog output module (8-Channels)
23.7.29.6	Managed ethernet switch(24 Port)
23.7.29.7	Communication Module (RIO)
23.7.30	Any other item & accessories not specified above but required to complete the work. Note: 1. Contractor shall list down all equipment with breakup of item, quantity and include the total price of these items. 2. Items not listed and required for completing the job shall be done by contractor without any additional payment.
23.7.31	**The Bidder shall list here details of any additional items required for a complete installation**

Code 26	**Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for ISPS of 3 MLD capacity plant at Vakil Garden**
Item	**Description**
26	**Civil and Building Works**
26.1	**ISPS Works**
26.1.1	Inlet manhole & chamber, Coarse Screen channels, Effluent chamber, Overflow chamber, Wetwell with Pump House, Valve & Flowmeter chambers, Thrust block and Anchor blocks etc.
26.2	**SUBSTATION FOR STP & ISPS**
26.2.1	Switch gear room, Electrical Sub station
26.2.2	Transformer yard with Chain link fencing and Gates
26.3	**UTILITY BUILDINGS**
26.3.1	Plant D.G. Room
26.3.2	Guard Room (Security Room)
	OTHER UTILITIES
26.3.3	Internal Roads & stormwater drains and landscaping
26.3.4	Name boards for units in Kannada & English
26.3.5	Approach Road to WwTP, TSPS
26.3.6	Soil Stabilization/Pile foundations/Stone columns/Ground Improvement Plan
26.3.7	GP2, Grouting for machine foundations and base plates
26.3.8	RCC Pre-Cast Compound Wall with gates, Chain link fencing
26.3.9	Site Cleaning, Tree Cutting
26.3.10	Nalla & flow diversion etc.
26.3.11	Gabion wall, Site retaining structure, electric cable trenches inside WwTP site.
26.3.12	Additional Backfill for entire Project including approach road (if required) and Minor Grading
26.3.13	Providing Information Board at Site premises
26.3.14	Tree Plantation
26.3.15	Box culvert/Bridge
26.3.16	Dismantling of existing structures and disposal (if required)
26.4	Any other works which Bidder feels necessary for project completion needs to be added including all essential Investigation, etc. required to complete the Works under 2.1
26.5	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.

Code 27	**Works-A (Lumpsum) - Supply and Installation of Mechanical Works for ISPS of 3 MLD capacity plant at Vakil Garden**
Item	**Description**
27	**Mechanical Design calculation and GA Drawings,Quality Assurance Plan and Documentation as defined in Volume 2 of Bidding Document**
27.1	Inlet & Effluent chambers, Overflow chamber,Screen channels with necessary screening arrangements (Trash & Coarse screen), Solids Grabing unit with monorail arrangement with moving trolley mechanism, Screening Conveyor, Screening collection arrangement,Sluice gates, weir gates and Inlet & Overflow piping with fittings and Hardware with piping and all allied works complete
27.2	Wet well with superstructure & Pumping system with necessary capacity of Submersible pumps with suitable valves and piping arrangements and Hardware and all allied works complete
27.3	Material handling system with suitable Cranes and hoist arrangements with Hardware and all allied works complete
27.4	Miscellaneous works such as flushing arrangements, dewatering and ventilation system including Hardware all allied works complete
27.5	Service water system including pumps with Hardware,piping,Valves and all allied works complete
27.6	Fire Fighting system for the whole plant, Tools Kit, Airconditioning system arrangement for PLC / SCADA & and all allied works complete
27.7	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.

Code 28	**Works-A (Lumpsum) - Supply and Installation of Electrical Works for ISPS of 3 MLD capacity plant at Vakil Garden**
Item	**Description**
28	**Electrical Systems [Refer Parts-6 & 12 in volume-2 of the bid document]**
28.1	**11kV underground Cables, Termination Kits at following locations as per scope, specification and drawings.**
28.1.1	11kV Outdoor cable termination at Tariff Metering Unit / BESCOM
28.1.2	11kV Indoor cable termination at incomer and outgoings of 11kV Load Break Switch Panel / VCB Panel
28.1.3	11kV Outdoor cable terminations at primary side of 11kV / 0.433 kV Transformers of Wastewater Treatment Plant
28.1.4	11kV XLPE Cable from Tariff Metering Unit / BESCOM to 11kV Load Break Switch Panel / VCB Panel
28.1.5	11kV XLPE Cables from 11kV Load Break Switch Panel / VCB Panel to Primary cable end boxes of 11kV/0.433kV Transformers of Wastewater Treatment Plant
28.1.6	11kV Cable Straight through joints
28.2	**Electrical equipments at Intermediate Sewage Pumping Station as per scope, specification and drawings.**
28.2.1	11kV Load Break Switch Panel / VCB Panel
28.2.2	Diesel Generator Set complete with AMF Control Panel
28.2.3	11kV / 0.433kV Transformers
28.2.4	415V Switchgear PCC
28.2.5	415V APFC Panels (Capacitor banks with Automatic Power Factor Correction Relay)
28.2.6	110V D.C Battery Bank, Battery Charger with D.C Distribution Board (if applicable)
28.3	**Motor Control Centers , Distribution boards etc of Motor Control Centres, Distribution boards etc at various locations in Intermediate Sewage Pumping Station, items as per scope, specification and drawings.**
28.3.1	415V LT Kiosk
28.3.2	415V PCC
28.3.3	MOV DB
28.3.4	Power DB
28.3.5	415V VFD Panels
28.4	**Lighting System at Intermediate Sewage Pumping Station with following major equipment, items as per scope, specification and drawings.**
28.28.1	Indoor Lighting Fixtures
28.28.2	Outdoor Lighting Fixtures
28.28.3	Emergency Light Fixtures
28.28.4	Lighting panels
28.28.5	Switchboards, Receptacles, Power Plug & Sockets, Switches, Ceiling fans with regulators etc
28.28.6	Point wiring with conduits, wires, supports etc for Lighting fixtures, Receptacles, Ceiling fans etc
28.28.7	Street Lighting and Area Lighting poles with Junction boxes and Over hang
28.5	**L.T Cabling System, HT/LT Cable Carrier System of L.T Cabling System, HT/LT Cable Carrier System at Intermediate Sewage Pumping Station with following major components as per scope, specification and drawings.**
28.5.1	L.T Cables
28.5.2	L.T Cable termination with glands and lugs
28.5.3	Cable trays on supports for both LT and HT Cables
28.5.4	Hume Pipe
28.6	**Earthing & Lightning Protection System of Earthing & Lighting Protection System at Intermediate Sewage Pumping Station with following major components as per scope, specification and drawings.**
28.6.1	Earthing Conductor for outdoor main grid

Code 28	**Works-A (Lumpsum) - Supply and Installation of Electrical Works for ISPS of 3 MLD capacity plant at Vakil Garden**
Item	**Description**
28.6.2	Earthing Conductor for indoor main grid
28.6.3	Earthing Conductors for outdoor equipments and Junction Boxes
28.6.4	Lightning Protection system with Vertical Air Termination network with fixing system, horizontal conductors, roof conductors along with holders, connectors, Down Conductors, test link boxes, lightning earth electrodes etc.
28.6.5	Earthing Conductor for indoor equipments
28.6.6	Earth pits
28.7	**Safety procedures with Signage for Electrical Equipments at Intermediate Sewage Pumping Station as per scope, specification and drawings.**
28.8	**The bidder shall list here details of any additional items required for a complete installation**

Code 29	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for ISPS of 3 MLD capacity plant at Vakil Garden**
Item	**Description**
29	**Instrumentation Systems**
29.1	**Instrumentation Systems as per Technical Specifications [Refer Parts-7 & 13 in volume-2 of the bid document]**
29.1.1	Electromagnetic Flowmeter's with Indicating Transmitter's with totalizer (full bore type) with flange Ends, rates shall be inclusive of mating flanges with necessary fasteners and gaskets, for the complete ISPS. The flow meter shall be Interfaced with PLC based HMI control system.Refer Parts-7 & 13 in volume-2 of the bid document.
29.1.2	Level Transmitter's with indicators & alarms as required including all required Mounting accessories for the complete ISPS and Interfacing with PLC based HMI control system.Refer Parts-7 & 13 in volume-2 of the bid document.
29.1.3	Differential Level Sensor's & Transmitter's with indicators & alarms as required including all required Mounting accessories for the complete ISPS. and Interfacing with PLC based HMI control l system.Refer Parts-7 & 13 in volume-2 of the bid document.
29.1.4	Conductivity type Level Switches (back up to level transmitter), High Level & Low Level sensing (with 4 point contact) with necessary instrumentation cabling,glands with suitable stub and flange and bolting arrangement for hook-up, for the complete ISPS and also Interfacing with PLC based HMI control system.Refer Parts-7 & 13 in volume-2 of the bid document.
29.1.5	Pressure Transmitter's with necessary instrumentation cabling,manifold,glands and conduit with suitable stub and flange and bolting arrangement for hook-up, for the complete ISPS. Also, Interfacing with PLC based HMI control system.Refer Parts-7 & 13 in volume-2 of the bid document.
29.1.6	Glycerine filled stainless steel pressure gauges (for individual pump discharge) of 150 mm Dia. Dail with nipple, snubber for vibration resistance and necessary length of SS tubing suitable for mounting , including isolating valve for maintenance etc.,complete with all lead and lifts etc, for the complete WwTP.Refer Parts-7 & 13 in volume-2 of the bid document.
29.2	**Control & Automation System [Refer Parts-7 & 13 in volume-2 of the bid document]**
29.2.1	Indoor type PLC / RTU embeded with Instrumentation Control Panel(ICP) of size approx. 1200 mm X 800 mm X 2000mm (LBH) , Fabricated out of min. 2 mm thick CRCA sheet Programmable Logic Controller (PLC) configured with Standalone CPU, Power supply, Communication Module,IO modules(modules configuration-DI& DO modules-16 channel, AI-8 channel & AO Modules-8 chaneel types) with minimum number of 8-Rack PLC back plane support for expandable IO modules and Potential free contacts, pre-bilt RS-485 port is embedded with the controller. the controller shall support the DNP-3 Protocol for wireless communication interfaces for data break-downs during any power interuptions.The actual PLC- IO list (Min.DI-100,DO-50, AI-16 & AO-4] for each SPS pumping station list) 1-No. of 6-port industrial Grade Managed Ethernet Switches and 1 no. of GPRS Gateway (Dual-SIM support for each pumping station) and also 15 inches panel mounted touch screen HMI display unit.
29.3	**Mandatory Spares to be considered for the control system on a minimum during commissioning.**
29.3.1	Central Processing Unit(CPU)
29.3.2	Digital Input Module (1 no. of 16-channel for each pumping station)
29.3.3	Digital output Module (1 no. of 16-channel for each pumping station)
29.3.4	Analog Input Module (1 no. of 8-channel for each pumping station)
29.3.5	Analog Output Module (1 no. of 4-channel for each pumping station)

Code 29	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for ISPS of 3 MLD capacity plant at Vakil Garden**
Item	**Description**
29.3.6	6-port industrial Grade Managed Ethernet Switches
29.4	6 KVA on line UPS system confirms to IS 16242(Part-I):2014 and IEC 60240-1: 2008 with IGBT technology pure sine wave output, double conversion with auto and manual static by pass switch single phase input / Single phase output for field Instruments cum Control System equipment including CCTV system
29.5	**CCTV System:**
29.5.1	16CH Embedded 4K NVR 2SATA expandable up to 20TB, audio input & Output, Two way communication supported, G7.11 audio format support, 128Mb recording throughput, 8 alarm inputs & 1 Output, RS485, HDMI, VGA ports to be supported with maximum 16 users, Op. temp -10 to 50 deg. C, NDAA compliant, UL/CE/FCC certified.
29.5.2	**Cameras:-** Minimum 2 Nos. of each blow cameras to be installaed & commissioned and those are: i) 4MP or higher IR Dome, Fixed lens min 2.8mm DC Iris, 1/2.7" progressive CMOS image sensor, Min. Illumination 0.005 (color), S/N Ratio: 50dB, Electronics Shutter: 1/8 ~ 1/32000, IR Distance: 30M, with built in video analytics ,WDR~120dB/BLC/HLC/3D DNR, Gain Control: 0 ~100%; SD card up to 256GB, PAN: 0-355, Tilt: 0-75, Rotation: 0-354; Video Compression: H.265 HEVC/H.264/MJPEG, Smart Codec; Triple Stream; Protocals: H.265 HEVC/H.264/MJPEG, Smart Codec; ONVIF: S/G/T; Op. Temp: -40 to 60 Deg; power consumption max. 6W; IP67,IK10,UL,NDAA,BIS Compliance. ii) 4MP or higher IR Bullet, Fixed lens min 2.8mm DC Iris, 1/2.7" progressive CMOS image sensor, Min. Illumination 0.005 (color), S/N Ratio: 50dB, Electronics Shutter: 1/8 ~ 1/32000, IR Distance: 30M, with built in video analytics ,WDR~120dB/BLC/HLC/3D DNR, Gain Control: 0 ~100%; SD card up to 256GB, PAN: 0-355, Tilt: 0-75, Rotation: 0-354; Video Compression: H.265 HEVC/H.264/MJPEG, Smart Codec; Triple Stream; Protocals: H.265 HEVC/H.264/MJPEG, Smart Codec; ONVIF: S/G/T; Op. Temp: -40 to 60 Deg; power consumption max. 6W; IP67,IK10,UL,NDAA,BIS Compliance accessories mounts to be considered. iii) IP IR PTZ Camera- 2MP 32x Network PTZ Dome Camera Max. 2megapixel (1920 x 1080) resolution, 4.44 ~ 142.6mm (Optical 32x) lens, Max. IR viewable length : 200m (656ft), Day & Night (ICR), WDR (150dB), DIS (Built-in gyro sensor), 1/2.8'' Progressive Scan CMOS, Intelligent Video / Audio Analytics, Intrusion Detection and Motion Detection, Shock detection, Azimuth display (Cardinal & intermediate directions),Multiple streaming, Wise Stream II support H.265, H.264, MJPEG codec support MicroSD / SDHC / SDXC memory 2 slots (Up to 512 GB) IP66, IK10 UL Certified PTZ Camera along with pole/wall mount L-bracket for Mounting, Power Adapter, IP66, TVS 4,000V Lightning Protection, Surge Protection and Voltage Transient Protection etc.
29.5.3	Surveillance HDD-4 TB.
29.5.4	Supply and installation of 24 inch (60.96cm) Full HD LED Monitor with Wall Mountable Stand, Height Adjustable, HDMI and VGA Ports with all accessories.
29.5.5	Installation, testing, Commissioning & Integration of CCTV system in Control room including mobile configuration and communication of entire system as per the directions of Engineer-in-Charge.

Code 29	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for ISPS of 3 MLD capacity plant at Vakil Garden**
Item	**Description**
29.5.6	Supply, laying ,testing and commissioning of 4-pair, CAT-6 Solid (Third party ETL Intertek tested up to 700 MHZ) to support 1Gbps with Cross (+) filler pair separator & PVC sheath 23 AWG, STP/UTP Cable , Meets or exceeds ANSI/TIA-568-C.2 and UL Listed &RoHS Compliant in the existing raceways /PVC conduits including making connections to information outlets and patch panels with ferruling at both ends for identification with necessary tools for punching stripping crimping and testing required etc., complete.
29.6	Surge Protection Device(SPD)
29.7	Armoured Instrumentation Cables(Power, Signal & Control) with instrumentation earthing for the plant
29.8	Instrument Cable Glands with PVC Shroud:1/2" NPT
29.9	**Cable Tray & Conduit**
29.9.1	Instrument Cable Tray(100mm W X 50H X 1.6 THK) with Accessories
29.9.2	HDPE Cable conduit of 150mm
29.10	**Earthing System**
29.10.1	GI Earth flat 25x6 mm
29.10.2	Earth pits chamber Copper plate 300 x 300 x 6 mm electrode and its accessories
29.11	Analog Junction Boxes (Level & Pressure Transmitters with 2-wire & Flow Transmitter with 4-wire and overall 3nos. Of Junction Boxes for ISPS)
29.12	2.0 TR Split AC, 3 Star capable of delivering not less than 21600 BTU/hr and above with operating on refrigerant R-410A / R-32, supply for SCADA control Room 2Nos and 1 for each RIO panel.
29.13	Control System Consoles for Operators (1-Table Desk with 2-Chairs industrial Grade standard)
29.14	Any other item & accessories not specified above but required to complete the work. Note: 1. Contractor shall list down all equipment with breakup of item, quantity and include the total price of these items. 2. Items not listed and required for completing the job shall be done by contractor without any additional payment.
29.15	**The Bidder shall list here details of any additional items required for a complete installation**

Code 32	**Works-A (Lumpsum) - Providing and Execution of Civil Works and Other Site Facilities for ISPS of 4 MLD capacity plant at Gottigere**
Item	**Description**
32	**Civil and Building Works**
32.1	**ISPS Works**
32.1.1	Inlet manhole & chamber, Coarse Screen channels, Effluent chamber, Overflow chamber, Wetwell with Pump House, Valve & Flowmeter chambers, Thrust block and Anchor blocks etc.
32.2	**SUBSTATION FOR STP & ISPS**
32.2.1	Switch gear room, Electrical Sub station
32.2.2	Transformer yard with Chain link fencing and Gates
32.3	**UTILITY BUILDINGS**
32.3.1	Plant D.G. Room
32.3.2	Guard Room (Security Room)
	OTHER UTILITIES
32.3.3	Internal Roads & stormwater drains and landscaping
32.3.4	Name boards for units in Kannada & English
32.3.5	Approach Road to WwTP, TSPS
32.3.6	Soil Stabilization/Pile foundations/Stone columns/Ground Improvement Plan
32.3.7	GP2, Grouting for machine foundations and base plates
32.3.8	RCC Pre-Cast Compound Wall with gates, Chain link fencing
32.3.9	Site Cleaning, Tree Cutting
32.3.10	Nalla & flow diversion etc.
32.3.11	Gabion wall, Site retaining structure, electric cable trenches inside WwTP site.
32.3.12	Additional Backfill for entire Project including approach road (if required) and Minor Grading
32.3.13	Providing Information Board at Site premises
32.3.14	Tree Plantation
32.3.15	Box culvert/Bridge
32.3.16	Dismantling of existing structures and disposal (if required)
32.4	Any other works which Bidder feels necessary for project completion needs to be added including all essential Investigation, etc. required to complete the Works under 2.1
32.5	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.

Code 33	**Works-A (Lumpsum) - Supply and Installation of Mechanical Works for ISPS of 4 MLD capacity plant at Gottigere**
Item	**Description**
33	**Mechanical Design calculation and GA Drawings,Quality Assurance Plan and Documentation as defined in Volume 2 of Bidding Document**
33.1	Inlet & Effluent chambers, Overflow chamber,Screen channels with necessary screening arrangements (Trash & Coarse screen), Solids Grabing unit with monorail arrangement with moving trolley mechanism, Screening Conveyor, Screening collection arrangement,Sluice gates, weir gates and Inlet & Overflow piping with fittings and Hardware with piping and all allied works complete
33.2	Wet well with superstructure & Pumping system with necessary capacity of Submersible pumps with suitable valves and piping arrangements and Hardware and all allied works complete
33.3	Material handling system with suitable Cranes and hoist arrangements with Hardware and all allied works complete
33.4	Miscellaneous works such as flushing arrangements, dewatering and ventilation system including Hardware all allied works complete
33.5	Service water system including pumps with Hardware,piping,Valves and all allied works complete
33.6	Fire Fighting system for the whole plant, Tools Kit, Airconditioning system arrangement for PLC / SCADA & and all allied works complete
33.7	Note: Any missing equipment from the actual scope of works as specified in the Volume 2 Bid Specification and Process Specific Requirement, Bidder shall consider such items are inclusive of this total package works and this list is to be treated as Tentative and Reference purpose only.

Code 34	**Works-A (Lumpsum) - Supply and Installation of Electrical Works for ISPS of 4 MLD capacity plant at Gottigere**
Item	**Description**
34	**Electrical Systems [Refer Parts-6 & 12 in volume-2 of the bid document]**
34.1	**11kV underground Cables, Termination Kits at following locations as per scope, specification and drawings.**
34.1.1	11kV Outdoor cable termination at Tariff Metering Unit / BESCOM
34.1.2	11kV Indoor cable termination at incomer and outgoings of 11kV Load Break Switch Panel / VCB Panel
34.1.3	11kV Outdoor cable terminations at primary side of 11kV / 0.433 kV Transformers of Wastewater Treatment Plant
34.1.4	11kV XLPE Cable from Tariff Metering Unit / BESCOM to 11kV Load Break Switch Panel / VCB Panel
34.1.5	11kV XLPE Cables from 11kV Load Break Switch Panel / VCB Panel to Primary cable end boxes of 11kV/0.433kV Transformers of Wastewater Treatment Plant
34.1.6	11kV Cable Straight through joints
34.2	**Electrical equipments at Intermediate Sewage Pumping Station as per scope, specification and drawings.**
34.2.1	11kV Load Break Switch Panel / VCB Panel
34.2.2	Diesel Generator Set complete with AMF Control Panel
34.2.3	11kV / 0.433kV Transformers
34.2.4	415V Switchgear PCC
34.2.5	415V APFC Panels (Capacitor banks with Automatic Power Factor Correction Relay)
34.2.6	110V D.C Battery Bank, Battery Charger with D.C Distribution Board (if applicable)
34.3	**Motor Control Centers , Distribution boards etc of Motor Control Centres, Distribution boards etc at various locations in Intermediate Sewage Pumping Station, items as per scope, specification and drawings.**
34.3.1	415V LT Kiosk
34.3.2	415V PCC
34.3.3	MOV DB
34.3.4	Power DB
34.3.5	415V VFD Panels
34.4	**Lighting System at Intermediate Sewage Pumping Station with following major equipment, items as per scope, specification and drawings.**
34.4.1	Indoor Lighting Fixtures
34.4.2	Outdoor Lighting Fixtures
34.4.3	Emergency Light Fixtures
34.4.4	Lighting panels
34.4.5	Switchboards, Receptacles, Power Plug & Sockets, Switches, Ceiling fans with regulators etc
34.4.6	Point wiring with conduits, wires, supports etc for Lighting fixtures, Receptacles, Ceiling fans etc
34.4.7	Street Lighting and Area Lighting poles with Junction boxes and Over hang
34.5	**L.T Cabling System, HT/LT Cable Carrier System of L.T Cabling System, HT/LT Cable Carrier System at Intermediate Sewage Pumping Station with following major components as per scope, specification and drawings.**
34.5.1	L.T Cables
34.5.2	L.T Cable termination with glands and lugs
34.5.3	Cable trays on supports for both LT and HT Cables
34.5.4	Hume Pipe
34.6	**Earthing & Lightning Protection System of Earthing & Lighting Protection System at Intermediate Sewage Pumping Station with following major components as per scope, specification and drawings.**
34.6.1	Earthing Conductor for outdoor main grid

Code 34	**Works-A (Lumpsum) - Supply and Installation of Electrical Works for ISPS of 4 MLD capacity plant at Gottigere**
Item	**Description**
34.6.2	Earthing Conductor for indoor main grid
34.6.3	Earthing Conductors for outdoor equipments and Junction Boxes
34.6.4	Lightning Protection system with Vertical Air Termination network with fixing system, horizontal conductors, roof conductors along with holders, connectors, Down Conductors, test link boxes, lightning earth electrodes etc.
34.6.5	Earthing Conductor for indoor equipments
34.6.6	Earth pits
34.7	**Safety procedures with Signage for Electrical Equipments at Intermediate Sewage Pumping Station as per scope, specification and drawings.**
34.8	**The bidder shall list here details of any additional items required for a complete installation**

Code 35	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for ISPS of 4 MLD capacity plant at Gottigere**
Item	**Description**
35	**Instrumentation Systems**
35.1	**Instrumentation Systems as per Technical Specifications [Refer Parts-7 & 13 in volume-2 of the bid document]**
35.1.1	Electromagnetic Flowmeter's with Indicating Transmitter's with totalizer (full bore type) with flange Ends, rates shall be inclusive of mating flanges with necessary fasteners and gaskets, for the complete ISPS. The flow meter shall be Interfaced with PLC based HMI control system.Refer Parts-7 & 13 in volume-2 of the bid document.
35.1.2	Level Transmitter's with indicators & alarms as required including all required Mounting accessories for the complete ISPS and Interfacing with PLC based HMI control system.Refer Parts-7 & 13 in volume-2 of the bid document.
35.1.3	Differential Level Sensor's & Transmitter's with indicators & alarms as required including all required Mounting accessories for the complete ISPS. and Interfacing with PLC based HMI control l system.Refer Parts-7 & 13 in volume-2 of the bid document.
35.1.4	Conductivity type Level Switches (back up to level transmitter), High Level & Low Level sensing (with 4 point contact) with necessary instrumentation cabling,glands with suitable stub and flange and bolting arrangement for hook-up, for the complete ISPS and also Interfacing with PLC based HMI control system.Refer Parts-7 & 13 in volume-2 of the bid document.
35.1.5	Pressure Transmitter's with necessary instrumentation cabling,manifold,glands and conduit with suitable stub and flange and bolting arrangement for hook-up, for the complete ISPS. Also, Interfacing with PLC based HMI control system.Refer Parts-7 & 13 in volume-2 of the bid document.
35.1.6	Glycerine filled stainless steel pressure gauges (for individual pump discharge) of 150 mm Dia. Dail with nipple, snubber for vibration resistance and necessary length of SS tubing suitable for mounting , including isolating valve for maintenance etc.,complete with all lead and lifts etc, for the complete WwTP.Refer Parts-7 & 13 in volume-2 of the bid document.
35.2	**Control & Automation System [Refer Parts-7 & 13 in volume-2 of the bid document]**
35.2.1	Indoor type PLC / RTU embeded with Instrumentation Control Panel(ICP) of size approx. 1200 mm X 800 mm X 2000mm (LBH) , Fabricated out of min. 2 mm thick CRCA sheet Programmable Logic Controller (PLC) configured with Standalone CPU, Power supply, Communication Module,IO modules(modules configuration-DI& DO modules-16 channel, AI-8 channel & AO Modules-8 chaneel types) with minimum number of 8-Rack PLC back plane support for expandable IO modules and Potential free contacts, pre-bilt RS-485 port is embedded with the controller. the controller shall support the DNP-3 Protocol for wireless communication interfaces for data break-downs during any power interuptions.The actual PLC- IO list (Min.DI-100,DO-50, AI-16 & AO-4] for each SPS pumping station list) 1-No. of 6-port industrial Grade Managed Ethernet Switches and 1 no. of GPRS Gateway (Dual-SIM support for each pumping station) and also 15 inches panel mounted touch screen HMI display unit.
35.3	**Mandatory Spares to be considered for the control system on a minimum during commissioning.**
35.3.1	Central Processing Unit(CPU)
35.3.2	Digital Input Module (1 no. of 16-channel for each pumping station)
35.3.3	Digital output Module (1 no. of 16-channel for each pumping station)
35.3.4	Analog Input Module (1 no. of 8-channel for each pumping station)
35.3.5	Analog Output Module (1 no. of 4-channel for each pumping station)

Code 35	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for ISPS of 4 MLD capacity plant at Gottigere**
Item	**Description**
35.3.6	6-port industrial Grade Managed Ethernet Switches
35.4	6 KVA on line UPS system confirms to IS 16242(Part-I):2014 and IEC 60240-1: 2008 with IGBT technology pure sine wave output, double conversion with auto and manual static by pass switch single phase input / Single phase output for field Instruments cum Control System equipment including CCTV system
35.5	**CCTV System:**
35.5.1	16CH Embedded 4K NVR 2SATA expandable up to 20TB, audio input & Output, Two way communication supported, G7.11 audio format support, 128Mb recording throughput, 8 alarm inputs & 1 Output, RS485, HDMI, VGA ports to be supported with maximum 16 users, Op. temp -10 to 50 deg. C, NDAA compliant, UL/CE/FCC certified.
35.5.2	**Cameras:-** Minimum 2 Nos. of each blow cameras to be installaed & commissioned and those are: i) 4MP or higher IR Dome, Fixed lens min 2.8mm DC Iris, 1/2.7" progressive CMOS image sensor, Min. Illumination 0.005 (color), S/N Ratio: 50dB, Electronics Shutter: 1/8 ~ 1/32000, IR Distance: 30M, with built in video analytics ,WDR~120dB/BLC/HLC/3D DNR, Gain Control: 0 ~100%; SD card up to 256GB, PAN: 0-355, Tilt: 0-75, Rotation: 0-354; Video Compression: H.265 HEVC/H.264/MJPEG, Smart Codec; Triple Stream; Protocals: H.265 HEVC/H.264/MJPEG, Smart Codec; ONVIF: S/G/T; Op. Temp: -40 to 60 Deg; power consumption max. 6W; IP67,IK10,UL,NDAA,BIS Compliance. ii) 4MP or higher IR Bullet, Fixed lens min 2.8mm DC Iris, 1/2.7" progressive CMOS image sensor, Min. Illumination 0.005 (color), S/N Ratio: 50dB, Electronics Shutter: 1/8 ~ 1/32000, IR Distance: 30M, with built in video analytics ,WDR~120dB/BLC/HLC/3D DNR, Gain Control: 0 ~100%; SD card up to 256GB, PAN: 0-355, Tilt: 0-75, Rotation: 0-354; Video Compression: H.265 HEVC/H.264/MJPEG, Smart Codec; Triple Stream; Protocals: H.265 HEVC/H.264/MJPEG, Smart Codec; ONVIF: S/G/T; Op. Temp: -40 to 60 Deg; power consumption max. 6W; IP67,IK10,UL,NDAA,BIS Compliance accessories mounts to be considered. iii) IP IR PTZ Camera- 2MP 32x Network PTZ Dome Camera Max. 2megapixel (1920 x 1080) resolution, 4.44 ~ 142.6mm (Optical 32x) lens, Max. IR viewable length : 200m (656ft), Day & Night (ICR), WDR (150dB), DIS (Built-in gyro sensor), 1/2.8'' Progressive Scan CMOS, Intelligent Video / Audio Analytics, Intrusion Detection and Motion Detection, Shock detection, Azimuth display (Cardinal & intermediate directions),Multiple streaming, Wise Stream II support H.265, H.264, MJPEG codec support MicroSD / SDHC / SDXC memory 2 slots (Up to 512 GB) IP66, IK10 UL Certified PTZ Camera along with pole/wall mount L-bracket for Mounting, Power Adapter, IP66, TVS 4,000V Lightning Protection, Surge Protection and Voltage Transient Protection etc.
35.5.3	Surveillance HDD-4 TB.
35.5.4	Supply and installation of 24 inch (60.96cm) Full HD LED Monitor with Wall Mountable Stand, Height Adjustable, HDMI and VGA Ports with all accessories.
35.5.5	Installation, testing, Commissioning & Integration of CCTV system in Control room including mobile configuration and communication of entire system as per the directions of Engineer-in-Charge.

Code 35	**Works-A (Lumpsum) - Supply and Installation of Instrumentation, Control & Automation Works including Laboratory Equipments for ISPS of 4 MLD capacity plant at Gottigere**
Item	**Description**
35.5.6	Supply, laying ,testing and commissioning of 4-pair, CAT-6 Solid (Third party ETL Intertek tested up to 700 MHZ) to support 1Gbps with Cross (+) filler pair separator & PVC sheath 23 AWG, STP/UTP Cable , Meets or exceeds ANSI/TIA-568-C.2 and UL Listed &RoHS Compliant in the existing raceways /PVC conduits including making connections to information outlets and patch panels with ferruling at both ends for identification with necessary tools for punching stripping crimping and testing required etc., complete.
35.6	Surge Protection Device(SPD)
35.7	Armoured Instrumentation Cables(Power, Signal & Control) with instrumentation earthing for the plant
35.8	Instrument Cable Glands with PVC Shroud:1/2" NPT
35.9	**Cable Tray & Conduit**
35.9.1	Instrument Cable Tray(100mm W X 50H X 1.6 THK) with Accessories
35.9.2	HDPE Cable conduit of 150mm
35.10	**Earthing System**
35.10.1	GI Earth flat 25x6 mm
35.10.2	Earth pits chamber Copper plate 300 x 300 x 6 mm electrode and its accessories
35.11	Analog Junction Boxes (Level & Pressure Transmitters with 2-wire & Flow Transmitter with 4-wire and overall 3nos. Of Junction Boxes for ISPS)
35.12	2.0 TR Split AC, 3 Star capable of delivering not less than 21600 BTU/hr and above with operating on refrigerant R-410A / R-32, supply for SCADA control Room 2Nos and 1 for each RIO panel.
35.13	Control System Consoles for Operators (1-Table Desk with 2-Chairs industrial Grade standard)
35.14	Any other item & accessories not specified above but required to complete the work. Note: 1. Contractor shall list down all equipment with breakup of item, quantity and include the total price of these items. 2. Items not listed and required for completing the job shall be done by contractor without any additional payment.
35.15	**The Bidder shall list here details of any additional items required for a complete installation**